

Radio Fun

\$2.00

"The beginner's guide to the exciting world of amateur radio."

in this issue

features

- 4 Capacitive Reactance W7KZE
10 Are You Getting the Best Reception? W2IMB
12 Two-Terminal Current Limiter N5GPL
15 SAREX STS-55 and STS-56 KC4YER

reviews

- 6 LOG-EQF WB2WPM
8 The ICOM IC-725 N4RVE

vintage review

- 14 The Swan SW-240 W2NSD/1

departments

- 27 Activities Calendar Staff
17 Ad Index Staff
23 Antennas, Etc. K4IPV
28 Flea Market Staff
5 Letters Staff
30 New Products Staff
3 QLF W2NSD/1
21 Radio Magic WB8VGE
19 The Tech Side KB1UM
22 Try Something New WB8ELK
29 Uncle Wayne's Bookshelf Staff
25 Upgrade . . .
Don't Stop Now WB6NOA
27 What's Next? WB2MGP

Florida Court Sides with PRB-1

A Florida husband and wife have won a partial victory in their fight to keep their antennas up and to stay on the air. David Brower WA4NST and Sharon Brower N4LXF of Vero Beach say an appeals court has found that local ordinances limiting tower heights to 70 feet are illegal. According to Judge John Kenney, the local regulation is preempted by PRB-1 and by Section 125.0185 of Florida state law. The Sunshine State has incorporated PRB-1 into law, making it illegal for municipalities to ban ham radio installations on those grounds.

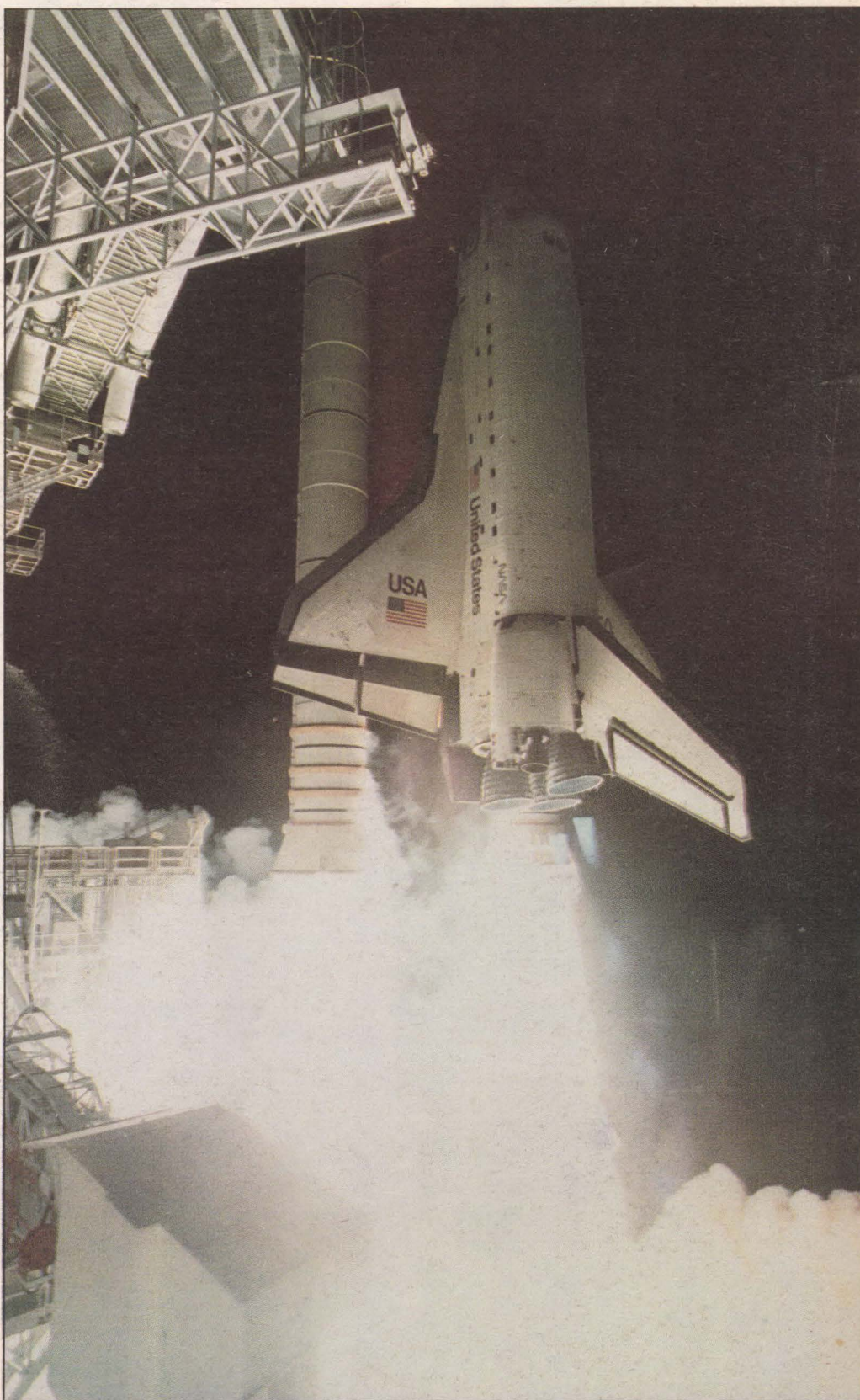
The Browsers still have an even more important fight ahead of them, however. They are trying to have a lower court ruling overturned which holds amateur radio to be an "... offensive nuisance to the neighborhood." The finding was based purely on deed restrictions which could make this decision more difficult to appeal. Still, the Browsers vow to continue their battle to regain their rights to operate their station out of their home. *TNX Westlink Report, No. 651, June 10, 1993.*

New FCC Leadership

The woman widely believed to be President Clinton's first choice to head the Federal Communications Commission withdrew her name from consideration on May 27 after giving birth to her first child. Senate aid Antoinette (Cook) Bush's withdrawal from the commission sweepstakes sparked speculation about why one of Bill Clinton's best qualified candidates would drop out.

Bush issued a statement saying, "Service on the FCC would have been a great challenge and an honor, but my life at this time is filled with other challenges and honors, including the recent birth of my son." "Cookie," as she is called, would have been the first black and the first woman to chair the FCC. *TNX Westlink Report, No. 651, June 10, 1993.*

Five Hams Fly Shuttle



Cape Canaveral, FL—It's all systems go as the Space Shuttle *Discovery* lifts off Launch Pad 39B on Mission STS-56. Commander Ken Cameron KB5AWP successfully led the all-ham space flight. Turn to page 15 for the complete SAREX story. (NASA photo.)

PACTOR SUPPORT
Now Included
For All
AEA Multi-Modes

WINDOWS TO THE WORLD.

Pakratt for Windows is the only data controller program for Microsoft® Windows™ on the market today. AEA gives you a true Windows application for controlling AEA's entire family of data controllers, including the new DSP-2232 and the new PK-900. This graphics-oriented program offers all standard Windows 3.x features (cut-and-paste, custom window sizing and color selection, etc.) and can run minimized or in the background if desired. Also, PC-Pakratt's multi-tasking allows you to run two data controllers simultaneously. Other features include complete parameter screens, binary and ASCII file transfers, macros, QSO logging, comprehensive help and much more.

Get a whole new outlook on ham radio
with PC-Pakratt for Windows from AEA.

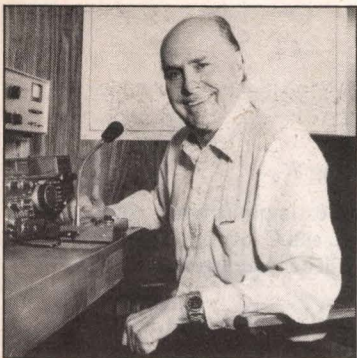
Connect with us for your nearest AEA dealer or for a
PC-Pakratt for Windows fact sheet.
Call our literature request line at (800) 432-8873.

**Advanced Electronic
Applications, Inc.**

PO Box C2160/2006 - 196th St. SW, Lynnwood, WA 98036
Sales: (206) 774-5554



Connect with us



QLF

by Wayne Green W2NSD/1

Starting New Publications

How come it costs so much to start a new publication? Heck, they give a lot of publications away, so why do others charge for subscriptions? Why aren't all publications free? Okay, let me explain how this whole thing works.

Let's start with how much it costs to get someone to subscribe. If we do this via a letter in the mail . . . junk mail . . . it costs a minimum of about 50¢ to get a letter to a potential subscriber. That's \$500 per thousand. How many letters you send out depends on how many subscribers you want. Let's say we're aiming to get 50,000 paid subscribers . . . how many letters is that going to take?

Thirty years or so ago we used to be able to get 10-12% response to a mailing. These days a 2% response is considered excellent. That's because there is such a bunch of junk mail that many people don't even bother to open the letters. Thus, if we're going to end up with 50,000 subscribers, we're going to have to send out at least 2.5 million letters, and that will cost \$1,250,000 just for the mail-

ing, and never mind the costs of billing and sending out the magazine. At \$20 per subscription we'd get back \$1 million, for a net loss of \$250,000. Looks like a tough business, right? Well, it actually isn't quite that bad.

If the publication depended entirely on subscription income it would fold fast, but half the income should come from advertising. Let's say we charge \$30 per ad page per thousand readers, which is about average these days for a fairly targeted publication. To get a thousand subscribers we'll have to send out 50,000 letters (\$25,000 cost). We'll get in \$20,000 in subscription revenue. But once we have them we can increase our ad rates by \$30 a page. If we're running 50 pages of ads this increases our advertising revenues by \$1,500 per issue, or \$18,000 for the year. Thus we end up about \$13,000 in the black on the deal, unless you want to count in any of the expenses of running the publication, printing it, or mailing it.

Not many publishers can find \$1,250,000 available to invest in a massive mailing, so

instead of trying to get the 50,000 subscribers all at once, we dribble the letters out. We can't cut them back very much because then it'll take forever to build circulation. So let's say we want to build this over a three-year period. That comes to a slightly more manageable \$35,000 a month. Since it takes about three to four months after a mailing before the bills are all paid, we can figure on rolling over the up-front investment every four months. This means we need a minimum of \$100,000 up front to start the subscription mailings. And that's if everything runs according to plan, complete with you getting a 2% paid-up subscription response. If it's 1.5% you're in trouble.

There's one absolute about publishing . . . nothing ever goes according to plan.

How About the Newsstands?

This is an even more expensive way to build circulation. In this field nothing is as it seems. Newsstands are controlled by a few national distributors. I've been selling my magazines on the newsstands for over 40 years now, so I know the business pretty well. If I send out 100,000 magazines for distribution and they say they've sold 40,000, I know they've probably sold about 80,000. There is no practical way to prove what they've actually sold, so I just have to accept their figures.

Unfortunately, a 40% claimed sale is outstanding, with many magazines getting reports of 12-15% sale. You sure can lose a bunch of money that way, and this probably helps to explain why 90% of the new publications don't last five years. This may explain why I didn't put *Radio Fun* on the newsstands.

Radio Fun

Instead of a direct mail subscription drive costing \$100,000 or so, or putting it on the newsstands, which could cost even more, I opted for advertising *Radio Fun* in 73 and sending the first issues free to all newly licensed amateurs. By using a tabloid format and inexpensive paper we've been able to make the ad revenues cover the cost of sending about three issues. It's a new approach and it's working. A high percentage of the new hams getting *RF* are subscribing. This allows us to keep sending it to the newer licensees.

No, *RF* isn't making a profit at this rate, but then neither is it losing money. If we could build our circulation faster we'd do as I always have, put the money into printing a fatter publication. So if you can help get us more subscribers or more advertisers, you'll be the winner. I didn't start *Radio Fun* to make money. I started it because I felt that the no-code newcomers in particular needed all the help they could get in enjoying our hobby. And I was right. I haven't seen any serious effort on the part of the other ham rags to help newcomers find out about how to have fun with packet, satellites, and so on. We have a ton of fun things to do, it's just that finding out how to get started with them isn't easy. Not many newcomers have a 10- to 40-year collection of magazines for reference.

We're running one of the most efficient publishing businesses I've ever seen. We have a minimum staff, the latest in Macintosh desktop publishing equipment, and so on. Most of *Radio Fun* is written by the readers, with the help of some outstanding columnists. **RF**

RAMSEY ELECTRONICS

PHONE ORDERS CALL

716-924-4560

FAX 716-924-4555

RAMSEY IS YOUR QRP KIT HEADQUARTERS

QRP TRANSMITTERS

20, 30, 40, 80 Meter
CW Transmitters

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a \$30 transmitter - that's ham radio at its best! These CW rigs are ideal mates to our receiver kits. They have two position variable crystal control (one popular QRP crystal included), one watt output (3/4W on 20m) and built-in antenna switch. Runs on 12VDC. Add our case and knob set for a handsome finished look.

only \$29.95!



CW Transmitters

QRP-20, 30, 40, 80 (specify band) \$29.95

CQRP Matching case & knob set \$12.95

Ham Receivers

HR-20, 30, 40, 80 (specify band) \$29.95

CHR Matching case & knob set \$12.95

HAM RECEIVERS

20, 30, 40, 80 Meter
All Mode Receivers

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in QST and ARRL Handbook. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational - ideal for beginner or old pro. 30 page manual. Add the case and knob set for well-fitted professional look.

YOUR SATISFACTION IS GUARANTEED. Examine your Ramsey product for 10 days. If you're not pleased, return in original condition for refund. Add \$3.95 for shipping handling and insurance. Foreign orders add 20% for surface mail. COD (US only) add \$5.00. Orders under \$20.00 add \$3.00. NY residents add 7% sales tax. Warranty: 90 days on kit parts; 1 year parts and labor on pre-wired units.

PHONE ORDERS CALL
716-924-4560 FAX 716-924-4555



RAMSEY ELECTRONICS, INC • 793 Canning Parkway • Victor, NY • 14564

CIRCLE 34 ON READER SERVICE CARD

Say You Saw It In **Radio Fun**

AUGUST 1993 3

Capacitive Reactance

by Larry R. Luchi W7KZE

[Editor's Note: This technical discussion of capacitive reactance is a bit more advanced than what we usually publish in Radio Fun, and it may leave some of you in the dark. If so, read it through a few times—slowly—and things should begin to sink in. If you want to get the most out of amateur radio, you've got to really understand this stuff—not just memorize a bunch of answers for a test. We've asked Mr. Luchi to prepare a series of articles focusing on various electronic components and their properties. We'll publish them from time to time, and if you stick with them, you'll be well on your way to a solid foundation in electronics.—David N1GPH]

In the May issue of *Radio Fun* I discussed capacitance. In this issue we will look at capacitive reactance, the opposition that a capacitor has to alternating current or a varying current. Symbolized X_C and pronounced X sub C, this opposition to flow is different from ohmic resistance because the opposition depends on the charging and discharging of a capacitor rather than atomic collisions within the material. Since it takes time to charge a capacitor, X_C is frequency dependent. That's why current into an ideal capacitor leads the voltage across the capacitor by 90 degrees. This is exactly opposite the effect in an ideal inductor where the voltage leads the current by 90 degrees. Capacitive reactance is measured in ohms.

Basic Ideas

An uncharged capacitor acts like a short circuit, whereas a fully-charged capacitor acts like an open circuit. When the current is sinusoidal (a periodic waveform that follows the sine function or an AC sine wave is considered to be the perfect waveform), the capacitor charges and discharges continuously during the cycle. Because of this, a capacitor has a different effect on alternating current than on direct current.

Effect on Direct Current

Figure 1a shows a DC source connected to a capacitor and resistor in series. If the capacitor is fully charged, its voltage drop equals the source voltage, which implies no voltage drop across the resistor and no current in the circuit. In other words, a fully-charged capacitor blocks direct current. This assumes an ideal capacitor, one whose leakage current is zero. (Leakage current is extremely small direct current through the dielectric. You can ignore leakage current in most capacitors, but it may be significant in electrolytic capacitors.)

Current

Figure 1b shows the same circuit with an AC source. Because the current is alternating, the capacitor will charge and discharge during each cycle. As a result, an alternating current does exist in the circuit. The amount of the AC current depends on the source voltage, frequency, and the capacitance. In Figure 1b, the AC current is the same throughout the circuit just as in any series circuit.

When the capacitance increases, the alternating current increases. If the capacitance decreases, the alternating current decreases. The point is that an ideal capacitor allows alternating current to pass, but blocks direct current. The larger the capacitance, the smaller the opposition to the alternating current.

Definition of Capacitive Reactance

Capacitive reactance is the opposition that a capacitor has to the alternating current into it. For an ideal capacitor, the capacitive reactance is mathematically defined as the ratio of the rms (root-mean-square: sine wave rms = peak value multiplied by 0.707 (cos 45 degrees) voltage across a capacitor to the rms current into the capacitor:

$$\text{Equation 1: } X_C = \frac{V_C}{I_C}$$

where X_C = capacitive reactance
 V_C = rms voltage across capacitor
 I_C = rms current into capacitor

Equation 1 is also valid for peak values and for peak-to-peak values. If you use an oscilloscope, peak-to-peak values are the most convenient to measure.

Definition of K

This is the measurement of the ability of material to use the magnetic tendencies of electricity. Air has a K_E of 1, while mica has an average of 6. The larger the K_E , the more capacitance.

How C and f Effect X_C

Figure 2a shows an AC circuit with a rms current of 10 mA into the capacitor. If a dielectric with a K_E of 10 is used (Figure 2b), the rms current is 10 times larger because the capacitive reactance is now 10 times smaller. The dielectric increased the capacitance by a factor of 10, which allows 10 times as much current to flow. Another way to get less capacitive reactance is shown in Figure 2c. The frequency is 10 times higher than in Figure 2a. The effect is to increase the rms current by a factor of 10.

Reactance Formulas

The basic formula for a capacitor is:

$$i = C \frac{dv}{dt}$$

This says that the charging current into a capacitor equals the capacitance times the instantaneous rate of voltage change.

Calculating X_C

When the voltage is sinusoidal, calculus can be used to derive the following formula for capacitive reactance:

$$\text{Equation 2: } X_C = \frac{1}{2\pi fC}$$

This formula for capacitive reactance is useful when you know the values of frequency and capacitance. Notice that X_C is inversely proportional to f and C. For example, if either f or C doubles in value, X_C will be half of its former value.

Direct current does not change directions, it has no frequency. This would be equivalent to f = 0. To calculate the capacitive reactance for direct current, you can substitute f = 0 in to equation 2-2. The results in $X_C = \infty$, which means a capacitor presents an open circuit to direct current.

Calculating C

Equation 2 contains three variables: X_C , f, and C. Given any two of these quantities, you can solve for the third. Another example is, if you know the values of f and C, you can substitute into the formula and solve for X_C .

When you know the values of f and X_C , you can solve for C by rearranging the equation to get:

$$C = \frac{1}{2\pi X_C f}$$

Calculating f

Another example is when you know the value of X_C and C, but not f. In this case, the equation can be rearranged as:

$$f = \frac{1}{2\pi C X_C}$$

After substituting for C and X_C , you can solve for f. Memorize Equation 2. The other two formulas are easily derived from it.

When using Formula 2 with a calculator, use the [EE] or [EXP] key for the exponent (power of 10). Your calculator will then default to a positive exponent. The sign change key [+/-] will change to a negative exponent for microfarads, 10^{-6} or picofarads, (10^{-12}). Practice with the following examples.

EXAMPLE for X_C where Capacitance = 100 pF, Frequency = 1 MHz:

$$X_C = \frac{1}{2\pi fC}$$

ENTER	DISPLAY
6.28 [X] 1 [EXP] 6 [=]	6280000
[X] 100 [EXP] [+/-] 12 [=]	0.000628
[1/X]	1592.356688 $X_C = 1592\Omega$

EXAMPLE 2: where Capacitance = 8 pF, Frequency = 28.1 MHz:

ENTER	DISPLAY
6.28 [X] 28.1 [EXP] 6 [=]	176468000.
[X] 8 [EXP] [+/-] 12 [=]	0.001411744
[1/X]	708.3437224 or $X_C = 708\Omega$

In our next article we will look at inductive reactance. **RF**

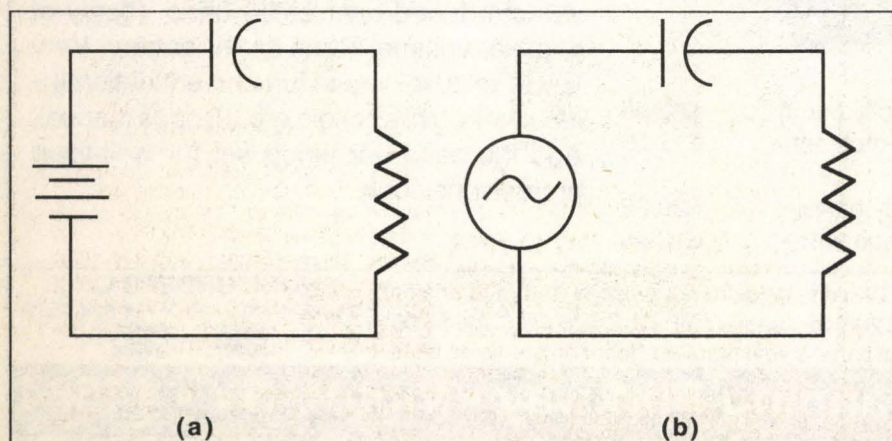


Figure 1.

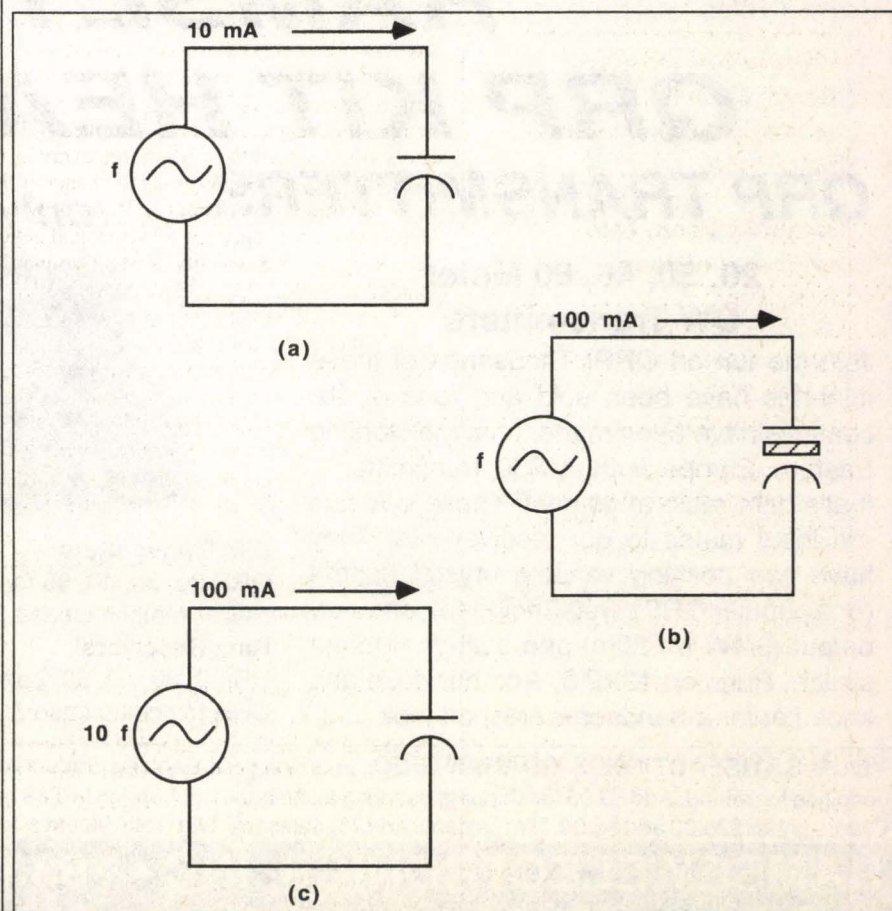


Figure 2.

Radio Fun

AUGUST 1993
issue #25

editor/publisher

Wayne Green W2NSD/1

associate publisher

David Cassidy N1GPH

managing editor

Hope Currier

senior/technical editor

Charles Warrington WA1RZW

editorial associates

Sue Jewell

Joyce Sawtelle

contributing editors

Bill Brown WB8ELK

Mike Bryce WB8VGE

Joseph E. Carr K4IPV

Michael Geier KB1UM

Carole Perry WB2MGP

Jeffrey Sloman N1EWO

Gordon West WB6NOA

advertising sales

representative

Paul Seppala

advertising coordinator

Judy Walker

603-924-0058

800-274-7373

FAX 603-924-9327

graphic design

Suzanne Self

desktop page make-up

Linda Drew

circulation manager

Harvey Chandler

subscription services

800-257-2346

Wayne Green, Inc.

editorial offices

Radio Fun

70 Route 202-North

Peterborough, NH 03458

603-924-0058

FAX: 603-924-9327

RADIO FUN (ISSN 1055-887X) is published monthly by Radio Fun, a division of Wayne Green, Inc., 70 Route 202-N, Peterborough NH 03458. Subscriptions: \$14.00 per year. Canada add \$8.00. Foreign add \$12.00 surface/\$32.00 airmail. Second class postage pending at Peterborough NH and additional mailing offices.

Printed in the U.S.A. by

Lighthouse Press, Manchester, NH

POSTMASTER: Send address corrections to RADIO FUN, P.O. Box 4926, Manchester NH 03108.

Entire contents ©1993 by Radio Fun. No part of this publication may be reproduced without written permission of the publisher.

letters



Write to: Radio Fun, 70 Route 202-N,
Peterborough, NH 03458

David Laustsen N3LHY, Doylestown PA Wayne, I enjoy 73 and Radio Fun. While some would blindly accept the pronouncements of the League and the "conventional wisdom" out there, you are one of the very few voices of vision and common sense regarding amateur radio policy.

Imagine where our hobby (or is it a compulsion?) would be today if we still had one-year, non-renewable, rock-bound Novice licenses. While the services provided for amateurs by the League are commendable, the notion that the League speaks for the amateur community is a fiction. For decades, the League's board has been dominated by old codgers who ran for office not on issues but rather to preserve the nonsensical status quo of FCC licensing policy. The League's board has no clear notion of why the amateur service is in existence. Neither does the FCC. Incentive licensing looks like a plan to reward the old World War II code guys with a band of their own—apart from the "great unwashed" that can't—or won't force themselves to copy high-speed Morse code. While there is nothing inherently wrong with a threshold code test for the HF bands, it makes no logical sense to bar licensees from certain band segments once that threshold test has been passed.

Perhaps the real reason for the creation of the amateur service is forever lost in history. I would speculate, however, that when the government decided to separate the "commercial" guys from the rest—and at that time there wasn't too much distinction between radio stations—there was no political will to remove anybody from the bands, only to reallocate frequencies. The amateur service became officially justified on the basis of emergency service, and became recognized as an important area of experimentation and development for radio technology. The other guys played music and sold commercials.

Today, all of us except the majority of the League's board know that the world has passed Morse code by as a form of emergency communication. Even ships don't use it anymore. When disaster communications are employed, they are almost always voice or packet—not CW. But as long as the League's board is controlled by those guys who learned the code in the army in the '40s, by God, nothing is going to change if they have anything to say about it. Right or wrong, that's the way it's been for 50 years, and anyone who suggests that we only need a five-word-a-minute code test is probably a communist.

The time has come for the amateur community to either make the League into a democratic and representative organization with regard to licensing policy, or to communicate directly with the government about reform. The League admonishes amateurs not to file comments or requests for rulemaking, as if somehow only the League has the benevolent wisdom to suggest licensing policy. The League's board would like to perpetuate an old boys' club that can't tolerate change. The guys on the board (and most of them are guys) are anti-no-code, anti-packet, anti-repeater, and some of them are still skeptical about single sideband. This board wouldn't think about running for office on issues. The League's board doesn't think that it is appropriate to poll the members on issues of license reform—because they don't think that they will like the answers they will hear.

Few, if any, amateurs who I have talked to have an objection to license tests that emphasize rules, regulations and electronic theory. Only a very few feel that for HF privileges, the 5 wpm

Continued on page 18

MFJ's world famous Ham Radio Accessories

Why do more hams throughout the world
use MFJ accessories than any other brand?
Because they are value packed and carry
MFJ's one year unconditional guarantee!

MFJ Speaker Mics

Compact or miniature models for all popular HTs

Compact Speaker Mics, \$24.95 each:

Once you try an MFJ Speaker Mic you'll never want to be without it. You'll be able to carry your handheld on your belt and never have to remove it to monitor calls or talk.

You'll never have to turn up your audio annoyingly loud to monitor calls because it's handy lapel/pocket clip lets you keep it close to your ear for easy listening.

And you'll never have to clumsily remove your handheld from your belt holder to talk because you can conveniently take the speaker mic in one hand, press the push to talk button and talk. Measure 1 1/4" x 2" x 3"

They come with a lightweight retractable cord that eliminates the dangling cord problem. They feature excellent audio on both transmit and receive. MFJ-284 for Icom or Yaesu; MFJ-286 for Kenwood.

Miniature Speaker Mics, \$24.95 each:

New miniature speaker mics pack all the features of the compact models into a tiny 2" x 1 1/4" x 1/4" package. The lapel pocket clip swivels for even more convenient positioning. Also features transmit LED. Choose from regular or "L" shaped connector. Order MFJ-285 or MFJ-285L for Icom or Yaesu, MFJ-287 or MFJ-287L for Kenwood. MFJ-283 for dual plug Alinco.

Deluxe 300 W Tuner



MFJ-949D
\$149.95
MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

SWR Analyzer

MFJ's innovative new SWR Analyzer gives you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or any other equipment!

Simply plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR. You can instantly find your antenna's true resonant frequency, something a noise bridge can't do. Covers 1.8-30 MHz (or choose MFJ-208, \$89.95 for 2 Meters). Use 9 V battery or 110 VAC with MFJ-1312, \$12.95.

VHF SWR/Wattmeter

MFJ-812B
\$29.95
Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4 1/2 x 2 1/4 x 3 in.

MFJ Multiple DC Outlet

MFJ-1112
\$29.95
New MFJ DC Power Outlet saves you space and money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. RF bypassing keeps RF out of power supply from DC line outlet. 13 1/2 x 2 3/4 x 2 1/2 in.

12/24 Hour LCD Clocks



\$19.95 MFJ-108B \$9.95 MFJ-107B
Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.

Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4 1/2 x 1 x 2; MFJ-107B 2 1/4 x 1 x 2 in.

MFJ Cross-Needle SWR/Wattmeter

MFJ-815B
\$69.95
MFJ Cross-Needle SWR/Wattmeter has a new peak reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.

Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Deluxe Code Practice Oscillator

MFJ-557
\$24.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter (\$12.95) that plugs into a jack on the side.

Tone and Volume controls for a wide range of sound. Speaker, earphone jack. Key has adjustable contacts and can be hooked to transmitter. 8 1/2 x 2 1/4 x 3 3/4 in.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; FAX: (601) 323-6551
TELEX: 53 4590 MFJ STKV

• One year unconditional guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • Add \$5.00 each s/h • FREE catalog MFJ... making quality affordable

CIRCLE 86 ON READER SERVICE CARD

by Shane P. Brady WB2WPM

- Full logging features.
- Automatic time, frequency, mode, etc., from the radio.
- QSL labels, with mailing address look-up.
- Near instant duping.
- Stand-alone rig control for most radios.
- Full feature packet terminal program.
- PacketCluster™ window and frequency import.
- Automatic country identification and beam headings.
- Ten-minute timer.

- The primary logging screen is laid out in an organized fashion with the callsign first, followed by RST, name and address, frequency, mode, power level, time, tracking, QSL status, and even a note pad. If you elect to interface LOG-EOE with your radio, the frequen-

If you enter a callsign that is already in the log, a sound is made and the last QSO with that station is shown in a window at the bottom of the screen. You can view every entry of that callsign you have made. The logging screen is automatically updated with the pertinent information, such as name, address, and QSL status.

Each OSO also has access to a NOTE PAD.

```

Log-EQF Copyright (C) 1993, N3EQF
Call sign ->N3EQF
Latitude (N = +)? 40.5
Longitude (E = +)? -80.1
Hours to add to clock time for UTC ->5

POWER level used most often ->100
Logbook Name used most often ->LOGBOOK

First Program Name for SHELL ->DX-EQF %C
Second Program Name to SHELL ->GEOCLOCK

<F1> = DATE FORMAT: mm-dd-yy
<F2> = PRINTER TYPE: Graphics
<F3> = RADIO: KENWOOD
      COM port number ->2
      Baud rate ->4800
      Parity (E/O/N) ->N
      Data bits (7/8) ->8
      Stop Bits (1/2) ->1
      Base Address ->2F8
      IRQ ->3

SETUP MENU - Hit <Esc> to exit.

[Degrees as a decimal number]
[Enter 0 if computer = UTC]

<F4> = PRINT COLOR: 15
<F5> = SCREEN COLOR: 1
<F6> = BORDER COLOR: ON
<F7> = TNC
      COM port number ->1
      Baud rate ->9600
      Parity (E/O/N) ->N
      Data bits (7/8) ->8
      Stop Bits (1/2) ->1
      Base Address ->3F8
      IRQ ->4

```

Figure 2. Configuration set-up screen.

Recent Spots		
18080.7	4K2MAL	UP...QSL UA4RC 1407Z
24899.8	4N5CEF	1408Z
21008.7	YN/SM0OIG	1416Z
21277.0	VU2DK	1418Z
21007.2	RB5QNA	CLG CQ USA 1424Z
21005.1	9A/PA3EBT	QSL VIA PA3EPN 1427Z
21269.4	UN8LA	SERGA 1432Z
21009.0	DL1AH	1432Z
21009.0	YI9CW	WKD UP ONE HALF KHZ 1433Z
21020.0	9G1AA	gsx 21.025 1429Z
.....		
.....		
.....		
.....		

Callsign	Frequency	Comment
4K2MAL	18.080.70	

Log-EQF - PacketCluster (tm)

Figure 4. PacketCluster main menu screen.

which you may access (Alt-N) for writing whatever you wish. This is a handy place to jot down your contact's radio and antenna information.

If you have your radio interfaced, you can control the VFO(s) frequency, switch between A/B VFO, and tune up and down. At this time LOG-EQF supports all Kenwood, ICOM and most Yaseu radios, which are set up for computer interfacing. Not all radios are the same, so some of the control features vary from radio to radio. The final screen item is a window across the bottom of the screen. If you are hooked up to a TNC, you have a PACKET WINDOW which you may monitor to keep abreast of what is going on. More on this later.

Any time you wish to leave the logging screen and go to the menu screen you just hit the ESC key. From the main menu you can look at the log in two ways. The first is in detail mode, where the screen shows only a few QSOs at a time, but with every bit of information entered. The second method is called Quick View. Here you get single-line QSOs with just the basic info: callsign, date, freq, mode, QSL info.

There are powerful printing routines. You can print your logbook out in either detailed or quick-view formats; the complete log or just the QSO's you desire. Of course, there is also a QSL label printer. Here you have five different styles of labels to choose from. There are four variations of the standard five-line label, including both U.S. (3.5" x 15/16") and European (3.5" x 1.5") labels. There is also a single-line (5" x 7/16") label that fits nicely on the popular QSL cards with the single-line boxes. When initially entering a QSO into the logbook, you can enter a "P" and then at a latter time it will automatically print out just the log entries with a "P"; the log is automatically updated to an "S" for sent! Of course, you can also print any individual or group of QSOs you wish. There is even a single line to put a personal message on the bottom of the five-line labels. The date can be printed either in US or European format, mm-dd-yy or dd-mm-yy. A new feature not found in other programs, is the ability to utilize the SAM'S DATABASE when printing labels. Indicate mailing labels, and during printing of the QSL labels it will automatically look up the name and address from the database, and print out a mailing label.

Editing

Editing is an important part of any logging program. LOG-EQF has a full-feature screen that allows you to go in and look at any QSO in the log and edit any portion of it. When you receive a QSL card you must edit the log to show that it has been received. From the main menu you can ask to search for a callsign. This search feature will look for exactly what you ask for: If you ask it to give you all entries for "GM," it will give you every entry that contains GM. Be careful, though—not only will you get all those Scotland QSOs, but you'll also get WB2GME, VU2RGM, etc. The more characters you ask it to search for the more selective the program becomes. You may utilize the DOS wildcards, * and ?, to further facilitate the search. By placing the full call of the QSL card you just received in the search field, all entries with that call will be shown along with their sequential QSO number. If only one entry has been made, then you go directly to the edit screen with all the info for the entry shown.

Just go down to the QSL field and change your "S" to an "X," hit F1, and all is edited and saved. You may search on two different fields if you wish. If you want a listing of all

VKs on 20 meters, you can specify such. Or how about a searching for CW contacts on 10 meters? It will do that, too. And if you wish to create a separate file from your search parameters this too is easily accomplished.

As mentioned before, there is a screen to monitor the local packet activity, while still in LOG-EQF. If you press F8 you are moved to a full-screen terminal window. From here you may log in to your local BBS, download and upload files, or hold a packet QSO with a friend across town. There is, of course, access to all of your TNC commands. To further enhance the packet portion of the program, Tom has set up a special window to monitor PacketCluster activity, with or without being hooked up to the cluster. From the main logging screen you monitor the Cluster activity going by in the packet window.

Press F9, and the Cluster window appears with a dozen of the most recent spots. Move the cursor bar to the one you wish to work, hit enter, and you are back at the logging screen with the DX spot's call entered. The DX country name has been entered and the beam heading is there for you to turn your beam to. In addition, if you have your radio interfaced, it will automatically be switched to the exact frequency! If you are logged into the local Cluster, announcing a DX spot couldn't be easier. With the call entered on the logging screen, a couple of key strokes will announce the spot for everyone else. The program reads the call and the frequency automatically; no need to re-type everything "exactly" right, the program does it for you.

Contesting

One of the nice features is the CONTEST MODE, which is selected from the main screen. Here you are able to enter the contest name, points for CW, and points for phone QSOs, and even space for multipliers. While not as sophisticated as stand-alone contest programs, it is ideal for the smaller, simpler contests. I find this excellent for the "QSO Parties" a lot of states put on, and for 10-10 contests. The "logging screen" is an abbreviation of the regular logging screen showing callsign, RST, serial number if required and, of course, any special contest exchange, i.e. WNY. To help pace yourself, there are two line items every good contesters relies on: time since the last QSO and the last 10 QSOs' rate per hour. Default RST and/or exchange is automatic. During the contest there is a Check Partial Call; those familiar with this feature know how indispensable it can be. No one ever expects their computer to die, especially during a contest. For this reason, there is a PRINT option that will print out each QSO as it is entered. This way you'll always have a backup (I wish all contest programs had this capability). Once the contest is finished, there is a separated dupe sheet generator, along with result and scoring pages to save all that after-contest paper work.

Upon registering, Tom will send you three additional program modules which interface with LOG-EQF. The first is RIG-EQF, a program to control your radio from the keyboard. This stand-alone program can be accessed from within LOG-EQF. A control screen on the monitor allows you access every function of your radio the manufacturer allows you to. At a flick of a key you can scan frequency ranges, at various rates; change VFO's, mode, RIT, XIT, etc. The top of the screen displays the frequency in large bold numbers. You can even key the transmitter from the keyboard. It is possible to set up and access remote memories.

You may actually input literally thousands of frequencies and descriptions from which you may automatically tune your radio.

This is great for taking advantage of the

general coverage portion of your radio. Tom even includes a half dozen sub-menus filled with SWL spots such as Radio China, the BBC, VOA, and so on. There is even room for short notes, such as times to listen.

The second module, DX-EQF, is a DXCC tracking program. Using the logs created from LOG-EQF you can keep track of your DXCC progress. You can look up summaries, or print out reports telling you how many and which countries you have worked, which ones you have QSLd but not received cards from, and even which ones have been credited by the ARRL. The reports can be mixed by band or by mode, or any combination of band and mode. DX-EQF, too, may be accessed while in LOG-EQF to check the status as you work a station.

Lastly, the third program registered users receive is FILE-EQF. This program is used to convert some of the more popular contest programs for importing into LOG-EQF. It will take contest programs such as CT and NA and convert them into LOG-EQF format. This way you can use powerful editing features to print QSLs, track countries, and combine contest logs. For dBASE users, FILE-EQF will convert to and from standard dBASE format.

Tom Dandrea has done a splendid job in implementing users' requests and ideas to form a tremendously powerful program. I know of no other program that does so much for so little, and he is constantly adding new features. This one program will replace your logging, rig control, and packet terminal programs, and save you hours trying to figure out how many countries you have confirmed on 40 meter RTTY.

The cost for registered users, who receive all current modules, is only \$25! If you wish to give LOG-EQF a test drive, drop Tom a note and \$5. Tom will supply the disk, just specify 3-1/2" or 5-1/4" disk, and he will send you the latest LOG-EQF logging program, which includes packet and basic radio support.

Pennsylvania residents please add 6% sales tax. Just write to: Tom Dandrea N3EQF, 396 Sautter Drive, Coraopolis PA 15108. **RF**

Isn't Your Radio Worth The Investment?
Protect It With



THE PACK-IT
FROM TRANSEL TECHNOLOGIES
TRANSEL TECHNOLOGIES

Protect your HT's, Cellular Phones, Pagers, and any other devices you carry that may be subject to damage.

The PACK-IT is made of 1/4" neoprene material which is safety belt sewn to the nylon protective backing. The PACK-IT doesn't fray like many other materials and is safe to wash whenever needed.

The strap and 2" beltloop is made from commercial grade webbing and is secured in the front with a Velcro hook and loop assembly.

The PACK-IT doesn't wear the radio like leather and protects the radio from the small falls which occurs in everyday usage. The neoprene material is a cushion material which not only covers the radio but also protects it. Various sizes available so call for the size to fit your need.

Made In The USA!

\$15.95 + \$3.00 S&H

1 (800) 829-8321

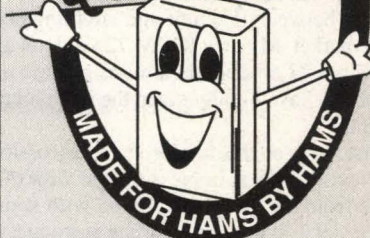
Dealers Welcome

CIRCLE 11 ON READER SERVICE CARD

SELL YOUR
PRODUCT IN
RADIO FUN
CALL PAUL SEPPALA
TODAY!
800-274-7373

REMEMBER...A LOW COST POWER PACK
WITHOUT PERIPHEX'S QUALITY IS NO BARGAIN

PERIPHEX POWER PACKS FOR
**LONGER
QSO TIME**



**SUPER PACKS FOR
ICOM 2/4SAT, 24AT & W2A**

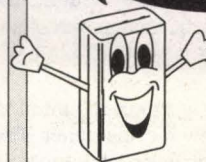


BP-83S 7.2V 750mah
\$43.50
BP-84 7.2V 1000mah
\$57.00
BP-84S 7.2V 1400mah
\$63.00
BP-85S 12V 800mah
\$76.00

BP-114S 12V 800mah
\$79.00

SAVE ON THESE POPULAR
PERIPHEX POWER PACKS
BP-7S 13.2V 1200mah ... \$65.00
BP-8S 9.6V 1200mah ... \$65.00

CALL FOR OUR
SPECIAL OFFERS



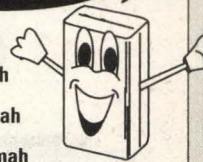
GREAT
YAESU VALUES!

FNB-2 10.8V 500mah
\$22.50
FNB-12 12V 500mah
\$45.95
FNB-14S 7.2V 1400mah
\$59.75
FNB-26 7.2V 1000mah
\$60.00
FNB-27S 12V 800mah
\$65.00

NEW BATTERIES
AVAILABLE. CALL!

KENWOOD

PB-8S 12V 800mah
\$59.00
PB-13S 7.2V 1200mah
\$49.75
PB-25/26S 8.4V 900mah
\$65.00



Manufactured in the U.S.A. with matched cells, these Super Packs feature short circuit and overcharge protection, and a 12 month warranty. All inserts and packs in stock or available from authorized dealers.

CALL US TO DISCUSS YOUR BATTERY REQUIREMENTS.



Add \$4.00 S & H for FIRST BATTERY, \$1.00 for EACH ADD'L BATTERY - U.S. ONLY. Connecticut residents add 6% tax.

PERIPHEX inc.
115-1B Hurley Road, Oxford, CT 06478

800-634-8132

In Connecticut 203-264-3985 - FAX 203-262-6943

CIRCLE 68 ON READER SERVICE CARD

RF review

The ICOM IC-725

An experiential viewpoint.

by Steve Roberts N4RVE

This is not a normal equipment review. There are no lab test results and no objective comparisons between this unit and anything else on the market. My new ICOM 725 did not arrive with a 73 product review assignment attached, nor have I really given the issue much thought.

What really counts in equipment discussion is the non-analytical impressionistic view that comes from experience, coupled with some commentary on how appropriate a product is for a given set of needs. And it was a specific need that drove my selection of this unit . . . bicycle-mobile HF operation.

Battery Operated Rigs

First, I have to say that no current commercial Japanese all-band HF rig is optimized for low-power operation. The two obvious candidates are the ICOM 725 and the Yaesu 747 (which also appears in slightly modified form as the Heath SB-1400). Both are fine units, but they draw a little over an amp on receive standby—far too high for casual all-night use on battery power. Compared to my old Argonaut 515, this astronomical power drain would have an inhibiting effect on operation.

But life is a tyranny of trade-offs. On this next trip, I want more power, more features, more precision, more operating convenience, and remote operation. For all the pleasure of the old Argonaut (and no, I haven't seen the new model), it's time to move up. But the inevitable cost is more weight, more power drain, and more complexity. Is it worth it?

Yes!

My ICOM 725 is now shock-mounted in the comm bay of the new bicycle trailer. The 725 offers a serial interface port known as CI-V; this is handled by a local New Micros FORTH 68HC11 in communication with the network up in the console. The radio's audio input and output are ported to a crossbar switch

that lets me conveniently operate with the Setcom helmet headset, a speaker mike, or through the UHF remote—and it's a simple matter to switch in filters and the like.

Its antenna output is cabled to a coax patch panel through which I can manually select mobile whips, external dipoles, the tuner, or whatever.

Reducing power drain is a little trickier, but I've managed an estimated 60-70% savings in standby current. The dial light is now switched, and the internal audio amp is bypassed in favor of the network. And it turns out that you can switch off the power amplifier when in receive with only a slight penalty in T-R delay. I'm rewiring the otherwise seldom-used TRANSMIT push-button for this purpose.

Actually, I may retire the 100 watt power amplifier in the 725. The ICOM engineers thoughtfully made it an easily removable module. The alternative, not available in the US but commonplace in Japan, is a 10 watt amplifier . . . just about perfect for my lifestyle, and MUCH lighter.

ICOM America Inc.
2380-116th Ave. N.E.
Bellevue WA 98004
Tel. (206) 454-7619
Price Class: \$972

725 Operation

So much for the custom installation. Fired up, whether in camp, on the road, or in a host's garage, the 725 is all business and a joy to use. It's a capable general coverage AM receiver as well as a multimode, all-band ham transceiver, and it has let me retire the trusty ICF-2002 digital shortwave I've carried for 16,000 miles. It has 26 memories (two of which work together for split-frequency operation on 10m FM or wherever), and two VFOs.

One of the nicest features is the architecture of the digital side of things, including what ICOM calls the "band stacking registers." (In essence, this makes it easy to wander around the bands and return to where you left off in each one without having to explicitly store the locations in memories. The operating mode is tracked intelligently, defaulting to the normal sideband in each case. Manipulating the data in memories and VFOs is simple enough to quickly become intuitive.

Tuning is very fast, and can occur in steps of 10 Hz, 20 Hz, 50 Hz, 1 kHz, 1 MHz, or by bands. The mechanism is simple—push-buttons labeled kHz, MHz, and band invoke annunciator arrows over the appropriate digits on the display, and turning the dial results in the corresponding tuning rate. All together, this results in real agility in getting around the spectrum, further augmented by three auto-

matic scanning modes and UP/DOWN buttons on the microphone.

Controls

The 725 has RIT, of course, along with an internal 10 dB preamp and 20 dB attenuator (but no RF Gain control). There is also an excellent noise blanker, along with AF GAIN, SQUELCH, MIC GAIN, and RF Power controls.

Missing is fast QSK operation, which I came to appreciate with the Argonaut, though the delay on the semi-break-in keyer is internally adjustable and I haven't experimented with it. More significant is the lack of a passband tuning or similar control, though I rarely encounter QRM situations that can't be resolved with an external audio filter system that includes spatial synthesis. ICOM offers optional plug-in CW filters, with 500 or 250 Hz bandwidth. (I should note that AM and FM transmission require another optional module, though AM reception is standard.)

The IC-725 in Action

My actual performance evaluation is subjective, and is influenced by all the variables that affect any station. Signal reports and comments on audio quality are consistently excellent within the expectations of band conditions. I'm only using a dipole and mobile whip, but I have no trouble with moderately competitive DX.

And the operating experience itself—the feel of the controls, the sound, the level of simplicity—are all superb. I've been a guest in a lot of shacks, and the IC-725 holds its own very well despite its small size.

ICOM offers companion automatic tuners (the AH-3 and AT-150) which are fully supported by the rig: just push the TUNER button. Also, the CI-V line makes it completely compatible with previous smart radios from ICOM. I'll be using the NM1D shareware Autolog program to control the radio from one of the DOS machines in the console, while also handling contact logging (or maybe I'll write one in Hypertalk for the Mac).

All in all, I can comfortably recommend this radio to anyone contemplating mobile operation, or anyone looking for a small-footprint rig for a crowded operating space. It seems to weather abuse well . . . since we're in a Santa Cruz layover, it has been extensively earthquake-tested. Indeed, it served as a lifeline to the outside world in the three days we were with no power.

RF



The ICOM IC-725.

Reprinted from the February 1990 issue of 73 Amateur Radio Today.

- Packet Radio - Portable & Affordable!

- ★ Simple Installation
- ★ No External Power
- ★ Smart Dog™ Timer
- ★ Perfect For Portable
- ★ Assembled & Tested
- ★ VHF, UHF, HF (10M)

Whether you're an experienced packeteer or a newcomer wanting to explore packet for the first time, this is the solution you've been waiting for! Thanks to a breakthrough in digital signal processing, we have developed a tiny, but full-featured, packet modem at an unprecedented low price! The BayPac BP-1 will transform your PC-compatible computer into a powerful Packet TNC. Although deceptively simple in appearance, the BP-1 supports sophisticated features like digipeating, file transfers, and remote terminal access, in addition to routine message handling. Here is YOUR CHANCE to join the PACKET REVOLUTION!

Tigertronics, Inc. 400 Daily Lane Post Office Box 5210 Grants Pass, OR 97527

Just...
\$49.95
+ Shipping

GET YOURS TODAY!

Toll Free Order Line

1-800-8BAYPAC

(1-800-822-9722)



Available Now!



(503) 474-6700

Fax (503) 474-6703



Model BP-1
Packet Modem
Made in U.S.A.



CIRCLE 269 ON READER SERVICE CARD

House to Honor Ham Radio

A joint resolution of Congress to recognize the achievements of radio amateurs, and to establish support for ham radio as a national policy, was introduced into the House of Representatives on May 20 as H.J. Res. 199. It is virtually identical to a measure introduced to the Senate on May 7. The House sponsors are Representatives Mike Kreidler of Washington and Jim Cooper of Tennessee. *TNX Westlink Report, No. 651, June 10, 1993.*

ITU up to 176

Three new countries from the former U.S.S.R. have joined the International Telecommunication Union as members so far this year. They are Georgia, Slovakia, and Kazakhstan. The ITU now has 176 member nations. *TNX W5YI Report, Vol. 15, June 1 1993.*

French Launch Orbiter

A new satellite has joined the amateur radio community. Sponsored by the French Radio Amateur Club de l'Espace (RACE), the ARSNE (UO-22) satellite was sent into orbit from an Ariane-4 rocket right on schedule on May 12 at 00:56 UTC. It was launched from the European Space Agency's spaceport in Kourou, French Guiana, on the northern coast of South America.

After all the minor bugs are worked out of the satellite, the ARSNE will be open to packet traffic from all radio amateurs worldwide. The orbiting digipeater is equipped with an uplink frequency of 435.100; downlink 2446.5 MHz. *TNX W5YI Report, Vol. 15, June 1, 1993.*

Send your news items to *Radio Fun*,
70 Route 202N,
Peterborough, NH
03458.

Say you saw it in Radio Fun!



9 Autry
Irvine, CA 92718
(714) 458-7277

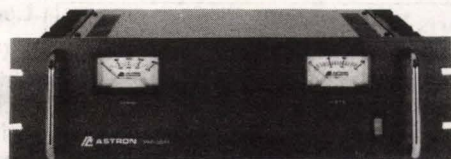


MODEL VS-50M

SL SERIES



RS-L SERIES



RM SERIES

MODEL RM-35M

RS-A SERIES



MODEL RS-7A

RS-M SERIES



MODEL RS-35M

VS-M AND VRM-M SERIES



MODEL VS-35M

RS-S SERIES



MODEL RS-12S

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC $\pm$ 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
SL-11A	• •	7	11	2 3/4 x 7 1/8 x 9 3/4	11
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L		3	4	3 1/2 x 6 1/8 x 7 1/4	6
RS-5L		4	5	3 1/2 x 6 1/8 x 7 1/4	7
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A		9	12	5 1/4 x 19 x 8 1/4	16
RM-35A		25	35	5 1/4 x 19 x 12 1/2	38
RM-50A		37	50	5 1/4 x 19 x 12 1/2	50
RM-60A		50	55	7 x 19 x 12 1/2	60
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-3A	• •	2.5	3	3 x 4 3/4 x 5 3/4	4
RS-4A	• •	3	4	3 3/4 x 6 1/2 x 9	5
RS-5A	• •	4	5	3 1/2 x 6 1/8 x 7 1/4	7
RS-7A	• •	5	7	3 3/4 x 6 1/2 x 9	9
RS-7B	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10A	• •	7.5	10	4 x 7 1/2 x 10 3/4	11
RS-12A	• •	9	12	4 1/2 x 8 x 9	13
RS-12B	• •	9	12	4 x 7 1/2 x 10 3/4	13
RS-20A	• •	16	20	5 x 9 x 10 1/2	18
RS-35A	• •	25	35	5 x 11 x 11	27
RS-50A	• •	37	50	6 x 13 3/4 x 11	46
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-12M		9	12	4 1/2 x 8 x 9	13
RS-20M		16	20	5 x 9 x 10 1/2	18
RS-35M		25	35	5 x 11 x 11	27
RS-50M		37	50	6 x 13 3/4 x 11	46
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
VS-12M		9	12	4 1/2 x 8 x 9	13
VS-20M		16	20	5 x 9 x 10 1/2	20
VS-35M		25	35	5 x 11 x 11	29
VS-50M		37	50	6 x 13 3/4 x 11	46
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
VRM-35M		15	35	5 1/4 x 19 x 12 1/2	38
VRM-50M		22	50	5 1/4 x 19 x 12 1/2	50
MODEL		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-7S	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10S	• •	7.5	10	4 x 7 1/2 x 10 3/4	12
RS-12S	• •	9	12	4 1/2 x 8 x 9	13
RS-20S	• •	16	20	5 x 9 x 10 1/2	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

Are You Getting the Best Reception?

Have some fun with a simple RF amplifier and a mini-antenna.

by Ken Cornell W2IMB

Many radio buffs use large antennas such as doublets, slopers and longwires for their all-band receivers. Usually, the longer and higher the better.

These were excellent antennas 50 to 60 years ago, and still aren't too bad if you live in the middle of nowhere. But are they the best antennas to use in a city or suburb today?

Modern technology has bombarded us with electromagnetic radiation from power lines, machinery, appliances and electronic devices, even from the common electric light dimmer. This radiation is picked up by your antenna—and a longwire can be a very effective noise collector. This type of interference is particularly severe at the lower end of the high frequency range and worsens as you go lower in frequency.

Years ago, LOWFERS who operated on the 160 to 190 kHz (FCC Part 15) band were plagued with this electromagnetic interference (EMI). We discovered that using a very short vertical antenna, three to six feet long, with a built-in preamplifier to make up for lack of aperture, was more effective in providing the best signal-to-noise ratio (S/N/R) than a longwire. We called it an "active antenna." It turned out that this type of antenna is also very effective for use in the medium-to-high-frequency range at noisy locations.

Design

Figure 1 shows a simple and proven design. Parts are easy to find, and a list with Radio Shack numbers is included as a convenience.

Q2 can be any type of HF, low-noise small-

signal NPN transistor. My favorite is a 2N3904. Connector BP-1 will depend on the type of whip antenna used. Don't use an antenna that's too long or you will lose the benefit it offers. The circuit is a broadband device and will amplify any signal in the radio frequency range, so necessary selectivity has to be provided by your receiver.

The device shown in Figure 1 is connected to the receiver with a short length of coax cable. Let's say that your receiving location is poor, especially for a small antenna. With a minor change, we can use a random length of coax cable and place the antenna at a better remote location. The coax cable serves a dual function: It provides power to the preamplifier and also provides a signal path from the active antenna to the receiver. We remove C2, C3 and R4 from the circuit in Figure 1 and connect the input from J1 directly to the collector of Q2. These removed parts are now placed in the circuit shown in Figure 2, which acts as a power supply isolator and receiver coupler.

The use of the SPDT switch SW-1 permits switching between the active antenna to a reference antenna for comparison purposes.

As previously mentioned, this device as shown in Figure 1 is a broadband amplifier. The selectivity and signal gain can be increased remarkably by adding a tuned circuit at the input. See Figure 3.

For the coils in the tuned circuit, we use RF chokes. Only eight of the 12 rotary switch positions are used. C4 is the largest variable capacitor you can use (within reason). If below 300 pF, you can use a fixed capacitor of the

same value and with switch SW-3 place it into the tuned circuit when required, particularly in the medium to low frequency range.

The coils as specified will provide coverage from 100 kHz to 30 MHz. Many modern receivers have a low frequency band starting at 100 to 150 kHz. This includes the LOWFERS band at 160 to 190 kHz.

The following is a list of the coils required. They are available from Mouser Electronics.

Coil Value	Mouser No.
4.7 mH	434-1120-473K (L1)
100 μ H	43LQ104 (L5)
2.2 mH	434-1120-223K (L2)
22 μ H	43LQ225 (L6)
1 mH	43LQ103 (L3)
6.8 μ H	43LQ686 (L7)
470 μ H	43LQ474 (L4)
2.2 μ H	43LQ226 (L8)

The coils are very reasonably priced at 99 cents each for the 434-1120 types and 38 cents each for the 43LQ series. The 434-1120 coils are 5/16" in diameter and 1/2" long, with leads out of one end. The 43LQ series are about the size of a 1/4 watt resistor. They are easy to

mount by soldering one end of each lead to the proper switch terminal and the other end to a common ground.

Mouser Electronics has four locations:

Santee CA, Tel. (619) 449-2222
Mansfield TX, Tel. (817) 483-4422
Gilroy CA, Tel. (408) 842-5522
Randolph NJ, Tel. (201) 328-3322

Their order and customer service telephone number is (800) 346-6873.

For the device shown in Figure 1, the parts can be assembled on a perf board that comes with the RS #270-283 project box. The same box can be used for the power supply and receiver coupler, as shown in Figure 2. The remote active antenna portion, however, if located outside, should be contained in a weather-tight housing. RG-58 or 59 can be used for the coax cable.

For the band switching preamplifier, Figure 3, I suggest mounting the parts on a piece of perf board and enclosing it in a RS #270-253 cabinet. Switches SW-2 and SW-3 (if used), along with the tuning capacitor C4, are mounted on the front panel. The antenna in connector BP-1, receiver-out jack J1 and the power input terminals are placed on the rear panel.

Loop Antenna

For the AM broadcast band DX hunters, we can consider providing a loop antenna connection to the tuned input, and one of the spare switch positions, such as #9, can be used for the loop input. An RCA phono jack can be used in the rear panel for the loop input.

The loop antenna is constructed on a criss-cross frame with spreaders at the ends to carry the spaced wires. See Figure 4.

For the AM BC band, a target range for the loop winding, based on an open wire box loop 24" per side, is 14 turns spaced 1/4" apart.

To insure spacing accuracy, make slots spaced 1/4" apart in the spreaders at the ends of the cross arms.

The loop can be mounted at the center of the cabinet top and still be able to rotate at least 90 degrees.

A loop antenna has directional properties that look like a figure-eight. Maximum gain is off the plane of the wires and there is a sharp null off the sides. This null can be useful for eliminating an interfering signal or noise source not in the same direction as the signal desired.

To connect the loop to the preamplifier

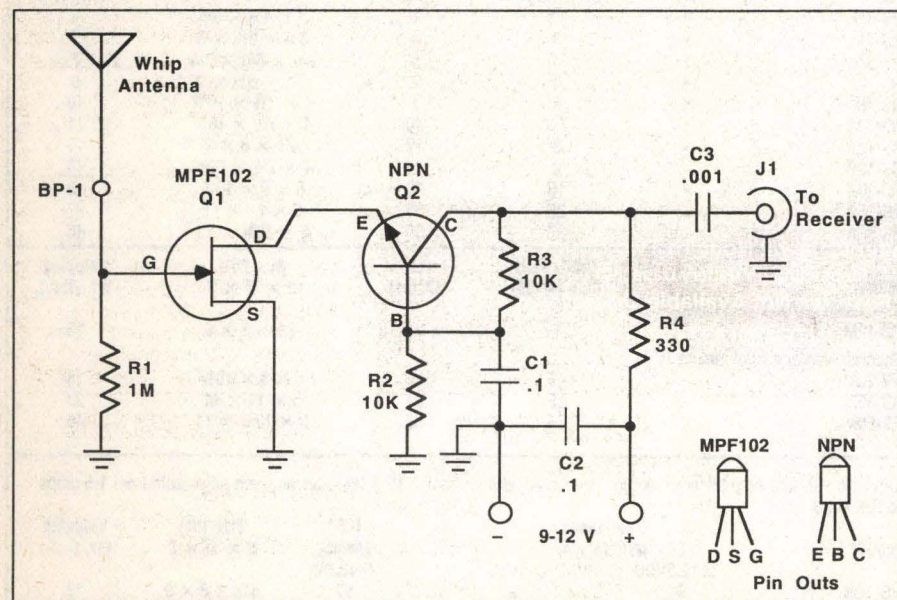


Figure 1. Schematic for the simple broadband RF amplifier.

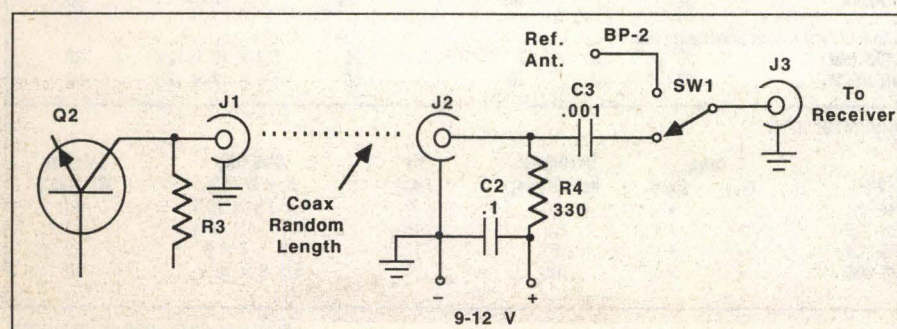


Figure 2. Power supply isolator/receiver coupler modification.

Parts List

Figure 1

C1,C2 RS#272-309
C3 RS#272-126
R1 RS#271-1356
R2,R3 RS#271-1335
R4 RS#271-1331
J1 RS#274-348 (RCA Jack)
Q1 RS#276-2062
Q2 RS#276-1009

Figure 2

J2,J3 RCA phono jacks
SW-1 SPDT Switch
BP-2 Connector for reference antenna

Figure 3

C5 RS#272-124
L1-L8 See coil specs. (above)
SW-2 1-pole 12-position rotary switch, RS #275-1385

C4,C4a, SW-3 See text

A drilled and etched printed circuit board is available from FAR Circuits, 18N640 Field Ct., Dundee IL 60118 for \$4 plus \$1.50 shipping and handling per order.

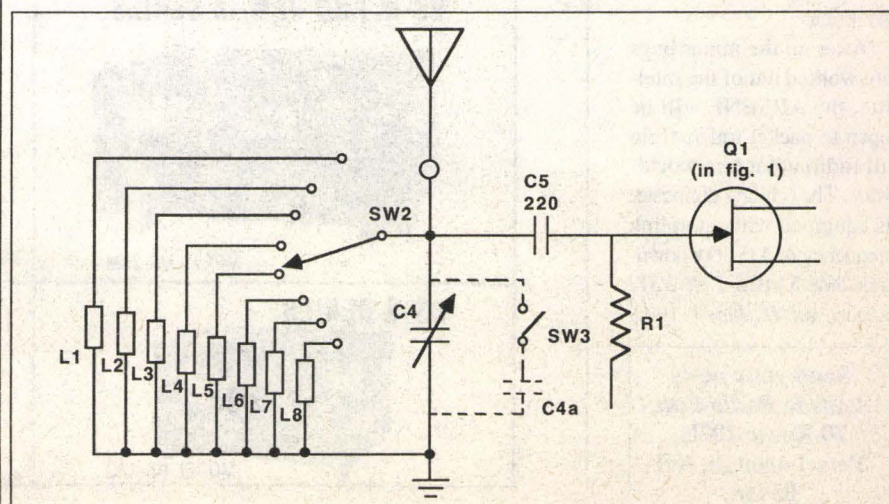


Figure 3. Tuned circuit input modification.

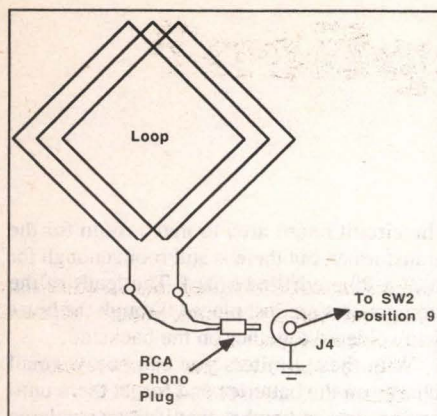


Figure 4. Loop antenna.

input, use two short lengths of stranded insulated flexible wire, twist them together, and place an RCA phono plug at the preamplifier's input jack. When soldering the transistors into the circuit, be sure to use a heat sink close to the transistor body to prevent damage.

To simplify construction, a drilled and etched printed circuit board is available from FAR Circuits, 18N640 Field Ct., Dundee IL 60118 for \$4 plus \$1.50 shipping and handling per order. The board has the parts placement screened on the component side for easy assembly. The PC board is laid out for assembly of the amplifier only, or to add the tuned circuits for increased selectivity and signal gain.

The antenna is attached to wiring point ANT1 when the tuned circuit (L1 through L8 and C4) is not used. When the tuned circuit coils are assembled on the board, the antenna is attached to the point labeled ANT2. The common point of the switch that selects the coils in the tuned circuit is attached to point SW-2 and each po-

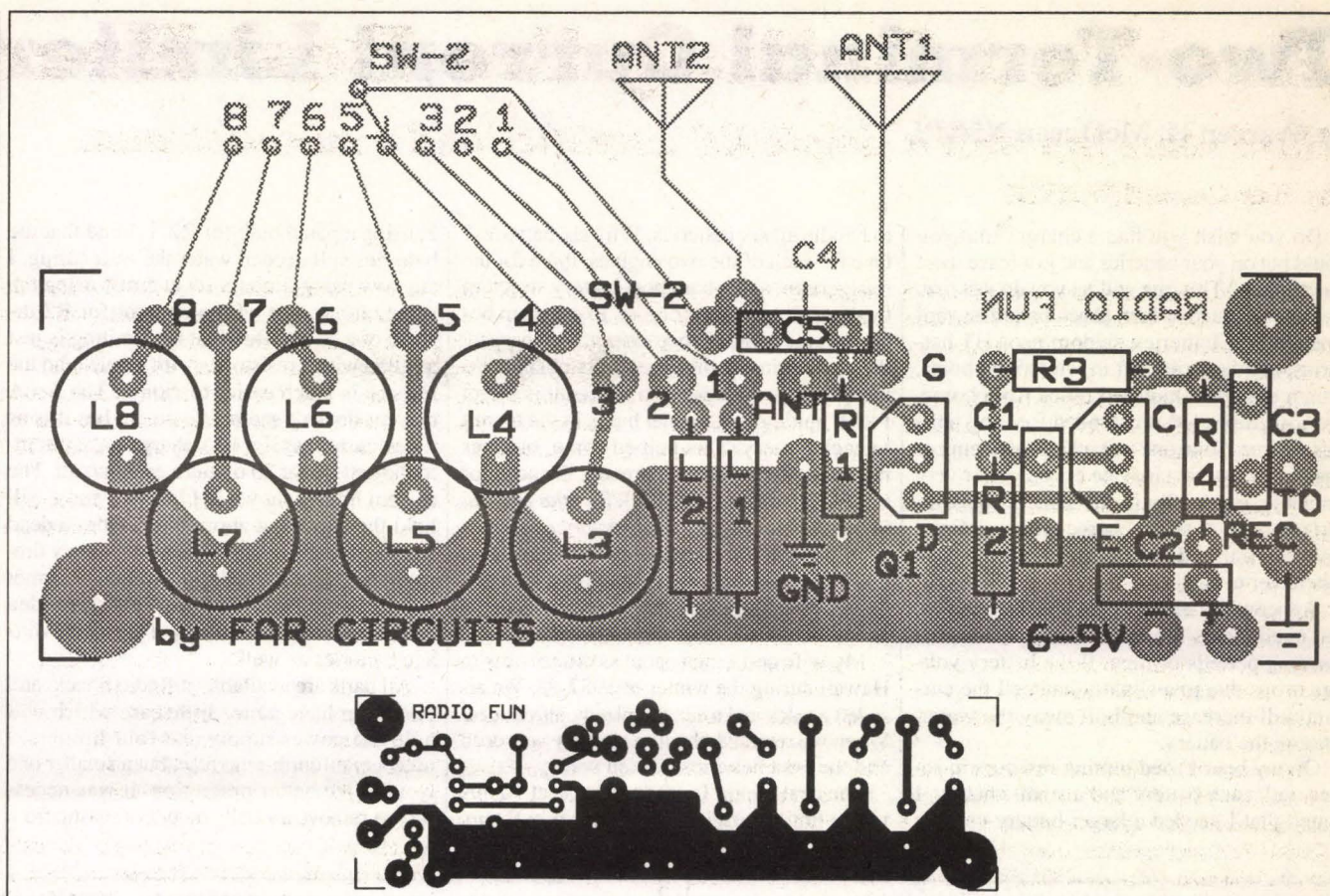


Figure 5. PC board pattern actual size and parts placement 200%.

sition of the switch is attached to the points labeled 1 through 8 on the board. The variable capacitor C4 is wired to the points C4 and GND. Wire the terminal of the stationary part

of the variable capacitor to the GND point on the board. Figure 5 illustrates the wiring of the PC board. To wire the board in the configuration shown in Figure 2, components C2, R4

and C3 are not placed on the PC board. A short wire jumper is placed in the C3 position on the PC board to allow the DC supply voltage to be coupled to the amplifier. **RF**

BATTERIES

REPLACEMENT BATTERIES (ALL NEW—MADE IN USA)

ICOM

7S 13.2v 1200 mah	\$54.00
8S 9.6v 1200 mah	\$52.00
BP7 13.2v 600 mah	\$59.00
BP8 8.4v 1200 mah	\$59.00

SA/SAT	
BP82, BP83	
BP83A 7.2v 750 mah	
BP84 7.2v 1000 mah 3"	\$40.00
BP85A 9.6v 600 mah 3"	\$69.00
BP85B 12v 600 mah 3"	\$69.00

KENWOOD



PB1 12v 1000 mah	\$59.00
KNB4 7.2v 2200 mah	\$59.00
PB6 7.2v 750 mah	\$46.00
PB7 7.2v 1500 mah	\$55.00
PB8 12v 800 mah	\$49.00

★ ★ ★ ★ ★ NOW AVAILABLE ★ ★ ★ ★ ★ FAST AND STANDARD DESK CHARGERS

FOR

YAESU, KENWOOD, ICOM, ALINCO and MOTOROLA.

These "SMART" Chargers Will Rapid Charge 6 Volt to 12 Volt Batteries in 1/2 Hour To Two Hours
(depending on Battery Capacity)

Many Advanced Features Not Available On Any Other Charger.

★ ★ ★ ★ SPECIAL INTRODUCTORY PRICES ★ ★ ★ ★ ★

Made in U.S.A.

NEW

ALINCO	
16N 7.2V 750 mah	\$35.00
18N 12V 600 mah	\$45.00

YAESU

FNB 25 7.2V 600 mah	
FNB 26 7.2V 1000 mah	
FNB 26A 9.6V 800 mah	
FNB 27 12V 600 mah	
FNB 27S 12V 800 mah	

YAESU

FNB-2 v 500 mah	
FNB-2 v 600 mah	
FNB-4A 12V 1000mah	\$55.00
FNB-17 7.2V 600mah	\$30.00
FNB-10S 7.2v 1000 mah	\$42.00

FNB-12S 12v 600 mah	\$45.00
290 charger	\$65.00
(For FNB 17,10S, 12S)	

Now Available: ALINCO 580

EBP-20N	7.2V	800 mah
EBP-20NX	7.2V	1200 mah
EBP-22N	12V	800 mah
EDC-34 RAPID CHARGER		\$81.00

INSERTS

CALL FOR LOWEST PRICES

ALINCO 10N, 12N
AZDEN 3000, 4000
ICOM BP-2, 3, 5, 7, 8, 7S, 8S
KENWOOD PB-21, 21H, 25, 26
REGENCY MT1000, HX1200
SANTEC 142, 144
STANDARD BP-1
TEMPO S-1, 2, 4, 5, BP-15, S-15
TEN TEC 2991, 2591
UNIDEN (BEARCAT)

CELLULAR

MITSUBISHI	\$50.00
NEC	\$45.00
NOVATEL	\$45.00
PANASONIC	\$45.00
Bag Phone Kits	
MOTOROLA "FLIP"	\$60.00

CAMCORDER

JVC	
PANASONIC	
PVBP80/88 12v 2.3 amps*	\$36.00
RCA/HITACHI	
Full size VHS-C	
SONY	
NP22	
NP55/77 2400 mah	\$39.00
ALL BRANDS AVAILABLE	
*original Panasonic	

*ALL BATTERY PACKS—GUARANTEED TO HAVE THE ADVERTISED CAPACITY

SEND FOR
FREE CATALOG

DEALER INQUIRIES
WELCOME

BATTERY-TECH, INC.

28-25 215 PLACE, BAYSIDE, N.Y. 11360 FAX 718-461-1978

800-442-4275 — N.Y.S. 718-631-4275



VISA



MASTER CARD



DISCOVER

CIRCLE 105 ON READER SERVICE CARD

Say You Saw It In **Radio Fun**

AUGUST 1993 11

Two-Terminal Current Limiter

by Warren H. McQueen N5GPL

Do you wish you had a charger that you could put on your batteries and just leave there indefinitely? This one will let you do just that.

Batteries such as ham shack batteries, yard maintenance batteries, seldom-used HT batteries, and batteries left in winterized boats, which may be a hundred miles from home, are sometimes left unattended for long periods of time. Someone may check on them occasionally, but that may be expensive or very unhandy, especially in the case of the winterized boat. A small charge with a definite voltage limit will keep them ready for use whenever needed.

Sometimes a trickle charger is put on them, but even this is too much current to be left for long periods of time. If the battery voltage drops due to a slightly bad cell the current will increase and boil away the water, ruining the battery.

On my boat I tried putting resistors in series with each battery and a small charger. I found that I needed a larger battery charger

to handle all six batteries. Why six batteries? One for each of the two engines, three for the refrigerator, and a bass boat battery stored in the boat. It took many hours to set them because as the current in one resistor was changed, the current in the other resistors changed in the opposite direction. To reduce this effect I tried putting small panel bulbs in the circuit to each battery. This helped some, but was not enough regulation to prevent the need for a lot of adjusting. *NOTE: When the current in the bulb increases, the resistance increases to prevent the current from increasing as much as it would in an ordinary resistor.* After a lot of adjusting, I got the currents set at about 32 mA on all of the batteries.

My wife and I then spent seven months in Hawaii during the winter of 1987-88. We also left a truck and a car completely unattended. When we returned, the truck battery was dead and the boat batteries needed water.

The next winter I set the currents at 10 mA with a limiter similar to that shown in Figure

2, using a panel bulb for R2. I found that the batteries still needed water the next spring. I am now using limiters set at 5 mA using the same circuit, but with a resistor for R2 instead of a bulb. I find that the limiting is just as good with a resistor as with a bulb, and the resistor is much easier to mount. The 5 mA current doesn't seem like much, but it is as much current as if a 10A charge were put into the battery for 20 minutes each month. The current limiter shown in Figures 1 and 2 will hold the current at about 5 mA from a dead short to about 13 volts. The power supply limits the voltage to the limiter so that it cannot put out more than 13 volts. This same idea can be used to limit the output for lower voltage batteries as well.

All parts are available at Radio Shack, and they even have a nice little case which will hold the power supply and four limiters. I used a one-fourth-amp fuse, but a smaller one would give better protection. It was necessary to remove a small amount of plastic from

the circuit board area to make room for the transformer, but there is still room enough for a 2" x 2" predrilled board. The leads of the components are just placed through the holes and soldered together on the backside.

With these limiters you can put its small charge on the batteries and forget them until spring. Just remember that if there is a large drain on the battery at some time the charger cannot recharge the battery.

RF

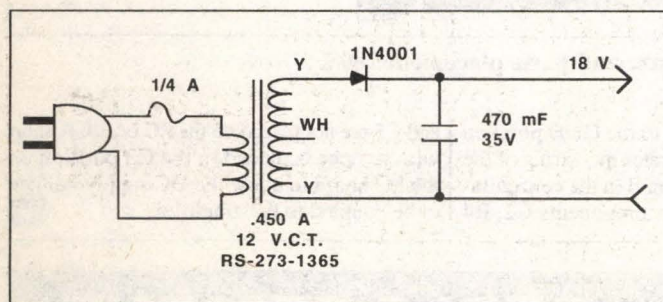


Figure 1. Power supply.

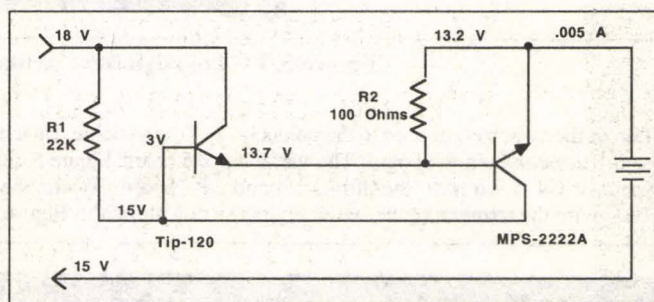


Figure 2. Current limiter.

Current Limiter Parts List

Quantity	Part	RS No.
1	Transformer	273-1365
1	Case	270-278
1	Three-prong cord	278-1258
1	TIP-120	276-2068
2	Clips	270-349
1	Perf board	276-149
1	Inline fuse holder	270-1281
1	470 μ F 35V capacitor	272-1018
1	2n2222A	276-2009
1	1/4A fuse	270-1270
1	1n4001	276-1101
3	4" tie straps	278-1632
1	4' red wire	278-1292
1	4' black wire	278-1292
1	22k resistor, 1/4W	271-1339
1	100 ohm resistor, 1/4W	
1	Shrink tubing	
1	Center screw, nut	

NEW ASA MADE IN USA MODEL 410 DUAL BAND VERTICAL BASE STATION ANTENNA 2m / 70cm

SPECIFICATIONS:

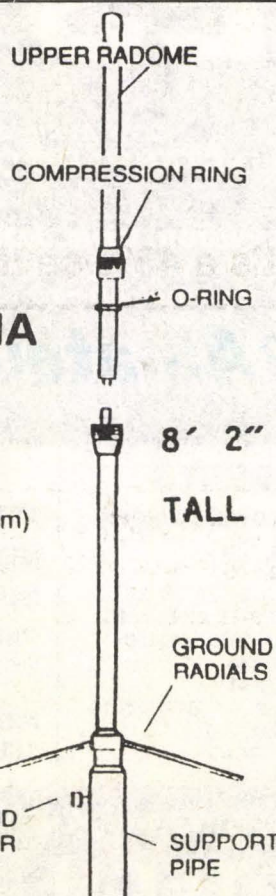
FREQUENCY:	144-148 MHz, 435-450 MHz
GAIN:	6.0dB (2m), 8.0dB (70cm)
BEAMWIDTH:	42 Deg. (2m), 17.5 Deg. (70cm)
POWER:	200 Watts (Max.)
IMPEDANCE:	50 ohms
VSWR:	Less than 1.5:1
WIND RATING:	112 MPH (Max.)
MAST DIA.:	1-3/16" to 2-7/16"
LENGTH:	98.4"
WEIGHT:	2.6 lbs
CONNECTOR:	UHF

\$97.50

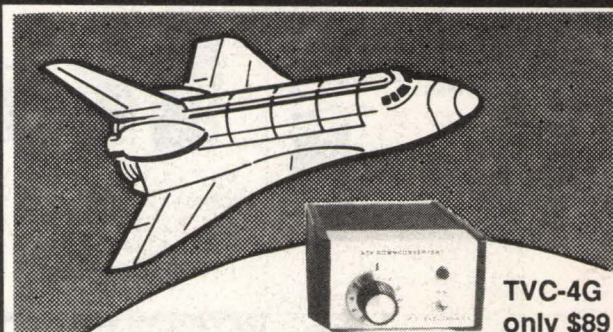
+ \$5.00 S&H (SC Residents Add 5% Sales Tax)
Check in Advance or C.O.D.

ASA PO Box 3461 Myrtle Beach, SC 29578

1 - 800 - 722 - 2681



AMATEUR TELEVISION



SEE THE SPACE SHUTTLE VIDEO

Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. Others may be retransmitting weather radar during significant storms. If it is being done in your area on 70 CM - check page 413 in the 91-92 ARRL Repeater Directory or call us, ATV repeaters are springing up all over - all you need is one of the TVC-4G ATV 420-450 MHz downconverters, add any TV set to ch 2, 3 or 4 and a 70 CM antenna. We also have downconverters and antennas for the 900 and 1200 MHz amateur bands. In fact we are your one stop for all your ATV needs and info. Hams, call for our complete ATV catalog - antennas, transceivers, amplifiers. We ship most items within 24 hours after you call.

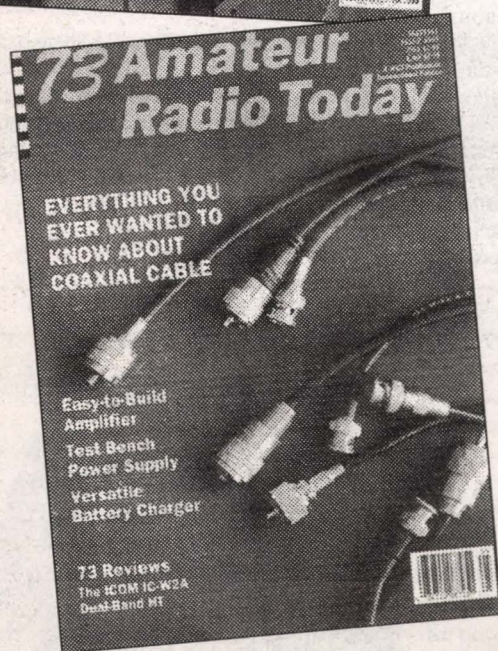
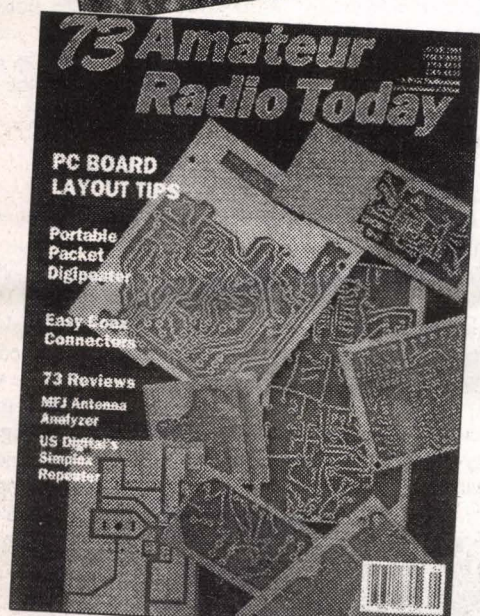
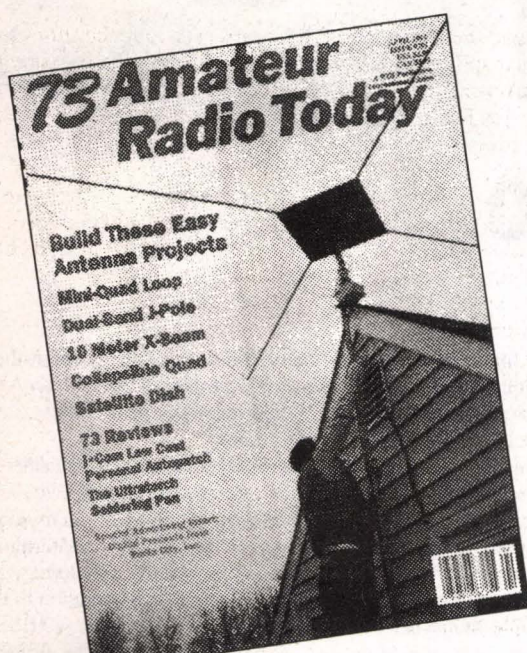
(818) 447-4565 m-f 8am-5:30pm pst.
P.C. ELECTRONICS
2522-WG Paxson Ln Arcadia CA 91007

Visa, MC, COD
Tom (W6ORG)
Maryann (WB6YSS)

CIRCLE 196 ON READER SERVICE CARD

PUT SOME EXCITEMENT BACK INTO YOUR HOBBY!

73 Amateur Radio Today



No other magazine brings you the exciting world of amateur radio like *73 Amateur Radio Today*.

- Equipment reviews you can use.
- Construction projects for all abilities.
- More antenna articles than any other magazine.
- Monthly columns covering the exciting worlds of RTTY, ATV, microwaves, QRP, foxhunting and more.
- "Never Say Die," Wayne Green's monthly view of the world of amateur radio.

– 12 issues for **\$19.97** –

That's a 43% savings off the newsstand price!

73 Amateur Radio Today

70 Route 202, North
Peterborough, NH 03458
(603) 924-0058
Fax (603) 924-9327

☐ YES! I want some excitement in my hobby.

Send me 12 issues of *73 Amateur Radio Today* for only \$19.97.

NAME

CALL

ADDRESS

CITY

STATE

ZIP

☐ Payment Enclosed ☐ Charge my: ☐ MC ☐ VISA ☐ AMEX

Card Number

Exp. Date

Newsstand Rate \$35.40. Basic Subscription rate \$24.97. Allow 4-6 weeks for first issue.
Canada add \$7.00 plus \$1.40 GST. Foreign add \$19 surface/\$42 airmail.

B9308G995

To subscribe by phone
Call: 1-800-289-0388

Removable Call Signs

2 1/4" x 8" PLASTIC

AMATEUR RADIO

W1AW

ORDER
NOW

- Your Call Letters or Repeater Freq
- Display Sign on Trunk or Rear Window
- Magnetic or Suction-Cup Mounted
- Transferable From Car to Car
- No Call Lettering Remains on Vehicle

Order -Magnetic or Suction-Mounted Version! Select -Black, Blue or Red Background! PRICE: \$9.95 . . . 2/\$18.

New Ham Discounts SASE Brings Info.



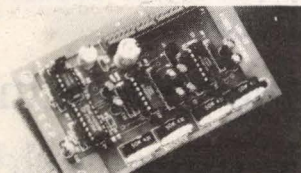
1923 Edward Lane
Merrick, NY 11566

Serving Ham Radio Over 12 Years

CIRCLE 35 ON READER SERVICE CARD

Say You Saw It In Radio Fun

UAI-10 AND UAI-20 UNIVERSAL REPEATER/LINK AUDIO INTERFACE



Detailed application manual
Low power operation, 19ma @ 12v
CTCSS decoder on the UAI-20 only
Assembled, tested, one year warranty
Link monitor-mix/monitor mute control
Adjustable repeater/link/DTMF audio outputs
Selectable DTMF mute on repeater and link audio
Repeater, link, auxiliary and control audio inputs

UAI-10 UAI-20
\$44.00 \$89.00

CREATIVE CONTROL PRODUCTS

3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405



CIRCLE 146 ON READER SERVICE CARD

Why buy a TNC?

PC HF FAX + PC SWL \$179.00

SPECIAL COMBINATION OFFER

For a limited time, if you order PC HF FAX \$99 (see our other ad in this issue), you can add our new and improved PC SWL 3.0 for \$80.00 instead of our regular low price of \$99.00.

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio. All you need is any IBM PC or compatible computer and an SSB shortwave receiver. The product consists of:

Demodulator
Digital Signal Processing Software
200 Page Tutorial Reference Manual
World wide Utility Frequency List
Tutorial Audio Cassette with Samples
PC SWL automatically decodes Morse code, RTTY, AMTOR, SITOR, NAVTEX and ASCII.

PC SWL lets you tune in on world press services meteorological broadcasts, ham radio operators, coastal shore stations, aviation telex and much more digital action on the shortwave bands. Why pay for another expensive box when a simple interface and your PC can do the job?

ADVANCED FEATURES:

Tuning Oscilloscope
Digital Waveform Presentations
Auto Calibration and Code Recognition
Continuously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Unattended Capture and Printing
Integrated Text Editor
Integrated Log and Database
Shell to DOS applications
Seamless Integration with PC HF Facsimile

Call or write for our complete catalog of products.
Visa & MasterCard welcome.

Software Systems Consulting

615 S. El Camino Real, San Clemente, CA 92672
Tel: (714) 498-5784 Fax: (714) 498-0568

CIRCLE 244 ON READER SERVICE CARD

RF vintage review



The Swan SW-240

by Wayne Green W2NSD/1

Back in May 1961, when I met Herb Johnson at the Phoenix Convention and had my first chance to look over his then brand-new Swan transceiver, I was surprised that he was able to turn out such a piece of equipment to sell at the low price of \$275. Herb was turning them out from a small plant in Benson, Arizona (where's that?), and was hardly able to keep up with the word-of-mouth demand for the product.

The first ad for the Swan was placed by Elliott Electronics in Phoenix in the September 1961 issue of 73. This really put the skids under them to try and keep up with the enlarged demand. Sideband operators began running in to Swan users on the air in growing numbers and the enthusiasm of these "salesmen" further bogged things down at Benson. A new and larger plant was badly needed. The new plant was put at Oceanside, California. This gave much better sources of supplies and labor.

When they finally got things running relatively smoothly at the new plant, the first ads placed by Swan were run in July 1962. Right from the beginning they were unable to keep up with the demand. The combination of a good product, a low price and a pent-up demand for sideband transceivers made things click.

While other manufacturers were aware of the growing demand for transceivers, it must be acknowledged that we wouldn't have over a dozen makes to choose from today if it had not been for the extraordinary success of the Swan.

Herb clearly saw the coming of the multi-band transceiver, so the new Swan 240 tribander has now replaced the three single-band models. It is hard to believe that the price of this tribander is only \$45 more than the monobanders. The price of the 240 was kept low by the rather ingenious method of building a sideband transceiver that is designed specifically for that: sideband transceiving. The unit covers the SSB portion of the 75, 40, and 20 meter bands, has adequate power to be used barefoot, and does not push up the price tag by trying to be all things to all people.

If you do want to use the 240 for AM operation the instruction book explicitly tells you how to make the additions and small changes necessary for this. Isn't this better than putting it in for everyone and adding another \$25 or so to the tag? CW ops can easily install grid-block keying according to the instruction book modifications, and even extend the range of the 20 and 80 meter bands to cover the CW segments. The 240 normally tunes and transmits lower sideband on 40 and 75, and upper sideband on 20 meters. Since almost all of the SSB operation on these bands observes this custom, the need for switching sidebands is rare. One of the major problems that has bedeviled ham manufacturers is drift. Commercially-built ham sideband gear was virtually impossible just a few years ago due to the warm-up and operating drift inherent in receivers and VFOs. Though these problems have been drastically reduced by modern components, circuits and mechanical designs, we still have not been able to produce a driftless rig. Swan's 240 has an interesting approach to this problem. They do everything possible to keep drift to an absolute minimum, and then provide you with a trimmer so you can introduce positive or negative temperature compensation to correct for any variation in components or in aging changes. Perfectionists should have a lot of fun with this little feature.

The 240 watt PEP of the Swan apparently caused some dismay in the sideband transceiver manufacturing field where everyone watches the other fellow's power claims about as carefully as the car manufacturers watch the horsepower claims of competitors. As I understand it, Swan had to get a signed note from RCA saying that 240 watts PEP didn't exceed their ratings for the 6DQ5 before certain magazines would accept their advertising. Heh, heh! I wonder what you can really run to the 240 if you start using ham-type inputs to the rig instead of commercially approved inputs? So the tube blushes a little when you yell; remember what we used to do to 6L6's? On the

other hand, 240 watts PEP is about the same effective juice as you put out with an AM kilowatt . . . and for many years this was considered pretty fancy.

There is another factor to be considered here too . . . that little old car battery. Even a heavy-duty battery may get kinky if you try to run too much power while mobilizing. Alternator systems will soon be popular and perhaps we can at that time give more consideration to the idea of running higher mobile power, with the higher cost of the power supply, etc. For the present, the Swan would seem to be a good compromise, running as much power as possible without putting a killing strain on the car system.

Installation

The 240's mounting bracket (included with the transceiver) can be quickly bolted under the dash of almost all cars. The 5-1/2" height doesn't force you to wear kneepads. The loudspeaker of your car radio can be hooked in so a second separate speaker is not needed. The power unit can be bolted to the fire wall behind the engine or on one side under the hood, with the power cable feeding through to the rig. The whole installation really shouldn't take more than two or three hours once you get the tools out and get at it. You'll probably spend more time putting in the antenna than the rig.

Well?

We tested the Swan 240 here at the 73 HQ ham shack for several days and were very pleased with it. The reports were more than satisfactory from the chaps we contacted and we could find no advertised specifications that were exaggerated. We all agreed that we really enjoyed using the Swan.

RF

Reprinted from the April 1963 issue of 73 Amateur Radio.

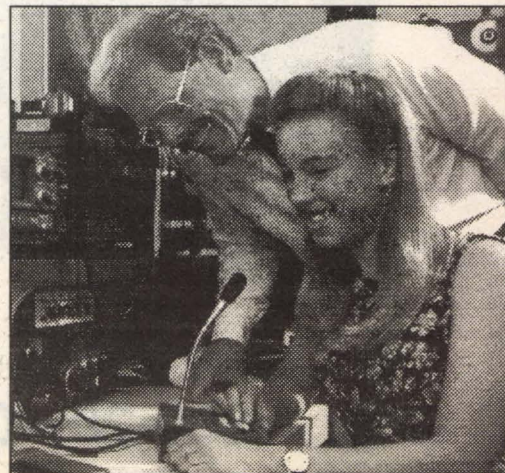
New Program Just for Elmers

Volunteer ham radio instructors can take advantage of a new FREE service providing valuable information and teaching resources. There are an estimated 2,000 volunteer instructors throughout the country whose only pay is the satisfaction of bringing newcomers up to speed—and into the amateur radio service. The "Just for Elmers" program was developed by Gordon West WB6NOA and the W5YI Group.

Program membership entitles you to a free

instructor newsletter, discounts, maps, charts, and other instruction tools. A phone call to (800) 669-9594 is all that is needed for membership. Or, you can contact Gordon West directly at (714) 549-5000 for further information.

Amateur radio "Elmers" are ambassadors for our hobby and they provide guidance to newcomers.



SAREX STS-55 and STS-56

Two missions two weeks apart.

by Philip Chien KC4YER

The SAREX team knew that 1993 would be a big challenge. Three shuttle missions in a row would fly with SAREX, and additional flights were also planned. Hams from previous shuttle missions were assigned to STS-55, STS-56, and STS-57. They were interested in continuing to use SAREX to help educate schoolchildren and to perform QSOs with hams worldwide.

The STS-55 mission (Photo A) was the second Spacelab mission dedicated to German experiments. Unlike the previous Spacelab D1 mission, where the SAFEX (Spacelab Amateur Funk Experiment) was used only by the German payload specialists over Europe, the German hams worked in cooperation with the U.S. hams, consequently STS-55 became the first shuttle mission to fly with two sets of ham hardware. Commander Steve Nagel N5RAW (Photo B) was the pilot for the original Spacelab Germany mission in 1985. In addition, he had flown on the STS-37 SAREX mission and had obtained his license for that flight (he also flew on 51-G). Spacelab D2 payload commander Jerry Ross N5SCW was also a veteran of the STS-37 SAREX mission, in addition to two other shuttle missions. Rookie astronaut Charlie Precourt KB5YSW got interested in SAREX and decided to obtain his license, too. In addition, both German payload specialists, Hans Schlegel DG1KIH and Ulrich Walter DG1KIM, had obtained German licenses. The other two crewmembers were pilot Tom Hendricks and mission specialist Bernard Harris.

The STS-56 mission (see cover photo), scheduled to follow STS-55, featured the second flight of the Atmospheric Laboratory for Applied Science (ATLAS). During the first ATLAS mission (STS-45), Mission Specialist Mike Foale KB5UAC (Photo C) had completed SAREX contacts with schools in England and was interested enough to get his own ham license (KB5UAC). The fact that the commander for the STS-56 ATLAS-2 mission was ham Ken Cameron KB5AWP certainly had a lot to do with it also. The other crewmembers for the STS-56 mission were pilot Steve Oswald KB5YSR, mission specialists Ken "Taco" Cockrell KB5UAH, Ellen Ochoa KB5TZZ, and Mike

Foale KB5UAC. As with his first shuttle mission, Ken Cameron convinced the rest of his crewmates to get their ham licenses. Ellen told me, "He's very persuasive"—certainly an understatement!

STS-57 Pilot Brian Duffy N5WQW was a veteran ham from the STS-45 SAREX mission. The other crewmembers are Commander Ron Grabe and Mission Specialists David Low, Jeff Wisoff, Nancy Sherlock, and Janice Voss.

The STS-55 mission had originally been scheduled for late February, with STS-56 following in late March and STS-57 in late April or early May. This would have resulted in an average of four weeks between missions, a tight but do-able schedule for the SAREX team. There are two sets of SAREX hardware, the -C (voice and packet) configuration and a separate set of hardware for the -D (voice, packet, SSTV, FSTV) setup, plus an additional packet module. The -C setup was aboard *Columbia* for the STS-55 mission, and the -D setup was aboard *Discovery* for the STS-56 mission. After the first SAREX flight was completed, its setup would have to be reconfigured for the STS-57 mission. Never had any other shuttle payload been required to fly so many times so quickly, but for a while it was beginning to look like NASA couldn't get any of its shuttles off the ground.

Murphy's Law struck—several times. *Columbia's* launch was delayed several times—by paperwork which required a set of engine seals to be swapped out and by a hydraulic line which had to be replaced. By this time NASA officials were seriously considering changing the order of the shuttle missions if there were any more delays to ensure meeting important scientific objectives. One scenario even proposed launching the three shuttles within six weeks!

Columbia was on launch pad 39A, ready to go on March 22. At 9:50:54 a.m. the engine start command was sent, but a preburner check valve failed to close and the third shuttle main engine failed to ignite. The computers shut down the launch, leaving spectators shaken.

Unplanned pad shutdowns of the shuttle's main engines had occurred twice before; in fact,



Photo A. The second German Spacelab flight goes off to a thunderous start as the space shuttle *Columbia* roars off Launch Pad 39A at 10:50:00 a.m. EDT, April 26. (NASA photo.)

the last time, STS 51-F, in July 1985, was also a SAREX mission!

The shutdown instantly threw the entire schedule off. It would take a minimum of three weeks

to turn around *Columbia* and refurbish its engines. On the other hand, *Discovery* was almost ready for flight, assuming its check valves didn't have similar problems.

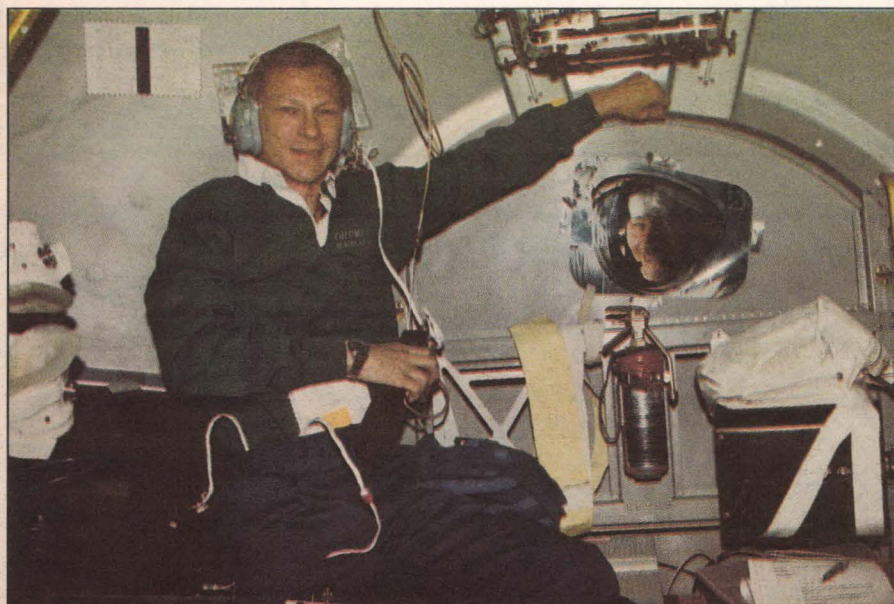


Photo B. Astronaut Steven R. Nagel N5RAW, STS-55 mission commander, has found an isolated station in the D-2 science module from which to talk to students on earth. (NASA photo.)



Photo C. Aboard *Discovery* (STS-56), astronaut J. Michael Foale KB5UAC talks to amateur radio operators on earth via SAREX. (NASA photo.)

Discovery

NASA decided to swap the shuttles, launching *Discovery* first, followed by *Columbia* a couple of weeks later. *Discovery*'s first launch attempt on April 6 was scrubbed just 11 seconds before launch due to a valve which was giving confusing readings. Managers were confident that the sensor was at fault and put in a software patch, using other sensors to verify the valve's status. *Discovery*'s actual launch took place on April 8 at 1:29:00.043 a.m. EDT, lighting up the Southeast night with a trail visible along the Eastern Seaboard as far north as Boston. The night launch was required to support the scientific objectives, viewing Northern Hemisphere sunrises.

During the nine-day mission Ken's crew took thousands of measurements of the earth's upper atmosphere and the sun's output. They deployed a free-flying satellite with two solar instruments to perform its own observations, and picked it up a couple of days later.

But the most exciting part of the mission was SAREX. On previous flights, SAREX had flown on *Columbia*, *Challenger*, *Atlantis*, and *Endeavour*. *Discovery* was the only shuttle orbiter which SAREX had not flown on. With the STS-56, mission SAREX became the first payload of any kind in the entire shuttle program to fly on all five shuttles.

The astronauts wanted to contact *Mir* and succeeded due to excellent coordination. A California ground station contacted *Mir* and asked the cosmonauts to contact the Johnson Space Center Amateur Radio Club (W5RRR) when they passed over Houston. Russian Space Agency cosmonaut Sergei Krikalev, in training for an upcoming shuttle mission later this year, passed up the frequency and time the astronauts would be available. On Saturday, April 10, at 23:20 UT, Mike Foale successfully contacted Alexander Poleshchuk aboard *Mir* while both spacecraft were over the South Pacific, traveling towards South America. They made contact and exchanged greetings before losing contact in the static. Capcom Carl Meade and flight director Bob Castle

congratulated the crew and all involved.

STS-56 also marked the first time amateur television was attempted on a high inclination mission. Previous ATV flights STS-37 and -50 had received some barely-viewable ATV. For -56, a new antenna was developed which could be placed in the forward windows, permitting a better line-of-sight with the ground transmitter. It all worked, and -56 returned the best ATV to date. Bill Morgan AB5FF of the Johnson Space Center Amateur radio club transmitted an unusual video to *Discovery*—live views of the Mission Control Flight Control Room. As flight controllers watched Ken Cameron via video transmissions through the Tracking Data and Relay Satellite System, Ken suddenly saw a view of Mission Control on his portable monitor. Astonished, he shouted out "Sam—wave your arms" to Capcom Sam Gemar. A couple of days later the mission control team kidded Sam that his green sweater was visible from 160 miles away (in orbit).

Discovery's mission was extended an extra day due to bad weather. Ken Cameron landed *Discovery* back at the Kennedy Space Center on April 17 at 7:37 a.m. EDT, completing a 3.8-million-mile journey. The SAREX equipment was quickly returned to the Johnson Space Center, reconfigured for use with the STS-57 mission, and flown back to Florida to get stored in *Endeavour*'s middeck.

Columbia

Columbia's second launch attempt was delayed two days for a precautionary changeout of an inertial measurement unit, but it still set a new record for shuttle turnarounds. Just nine days after *Discovery*'s landing, *Columbia* was in its final countdown. The previous record between a landing and launch of a crewed spacecraft was in 1986—from the 61-C mission to the 51-L *Challenger* accident. *Columbia*'s launch took place at 10:50 a.m. on April 26.

Since two independent sets of ham hardware were aboard the shuttle, with two types of antenna designs, the SAREX team cooperated with

their German colleagues to perform an antenna test. On two successive passes over the Southeast United States, Charlie Precourt transmitted from *Columbia*, first using the internal window-mounted SAREX antenna and then with the external dipole SAFEX antenna. Forms were distributed to ground stations at the Motorola Amateur Radio Club in Boynton Beach and the IBM club in Boca Raton, and to school groups and interested hams throughout the southeastern United States. Joan Freeman KD4SRD, a teacher at South Seminole Middle School, near Orlando, Florida, invited students to come to school early to participate in the antenna test. Ed Cox W0RAO loaned the school his gear for the test. There was a lot of enthusiasm, with the students recording S-meter readings while listening to *Columbia*'s transmissions. Preliminary data has shown that the external antenna is 10 to 12 dBi better than the internal antenna, with the SAFEX antenna at +6 dBi and the window antenna at -6 dBi.

As usual, several SAREX educational contacts were scheduled. Air Force Academy graduate Charlie Precourt had been an exchange student with the French Air Force Academy, and got to talk to students at both schools. All of the school contacts were successful, but one contact required much more effort: with Trumansburg Middle School in Trumansburg, New York. The planned contact wasn't possible because the shuttle was facing another direction to support one of the Spacelab experiments. Since SAREX is a secondary payload, other experiments have priority. The Trumansburg contact was rescheduled for later on in the mission. This time the SAREX antenna cable came loose, canceling that attempt. There was enough time in the crew contact so the school got scheduled for an unprecedented third attempt, this time with the SAFEX antenna in the Spacelab module. It was a full-quieting contact which lasted from end-to-end for the theoretical horizon.

The SAREX educational contacts are possible because of many dedicated hams, both at the local schools and within NASA. Hams at the Goddard Spaceflight Center involved in prepar-

ing and monitoring educational contacts include Ron Parise WA4SIR, John Stolarik K3CLG, Pat Kilroy WD8LAQ, Bill Boston N3DCI, Jim Gass N3CJN, John Mattox N3HQ, and Frank Bauer KA3HDO. The Goddard hams will talk to the schools ahead of time and assist with rehearsals over the phone, simulating the student's contact with the shuttle.

Late in the mission, *Columbia* lost communications with the ground during a TDRS handover. NASA uses two geosynchronous Tracking Data and Relay Satellites (TDRS) to communicate with the shuttle, and while passing communications from one TDRS to the next a command was accidentally sent which caused the shuttle's Ku-band antenna to lose its track of the satellite. There were attempts to use NASA's backup ground stations to contact the shuttle, but the crew had shut off its VHF radios to save power. The SAREX team contacted Gordon Williams VK6IU in Australia, and he powered up his equipment to try to contact the shuttle. However, before *Columbia* reached Australia, flight engineer Charlie Precourt realized that he was out of communications for too long a period to be considered normal, and was able to determine that the Ku-band antenna was facing in the wrong direction.

By coincidence, the capcom on duty in Mission Control was Jay Apt N5QWL, who had a different TDRS problem on his previous mission and SAREX had been used successfully that time to contact the shuttle. All together, the crew was out of voice contact for one hour and 20 minutes, and some of their scientific data was lost.

Besides reaching hams on the ground, Steve Nagel successfully contacted *Mir* and had a nice conversation with his Russian counterparts.

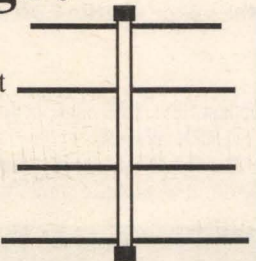
During the STS-55 mission, *Columbia* set two additional records. *Columbia* passed 100 days in orbit, and the entire shuttle program passed the equivalent of a year in space.

As we go to press, the next two SAREX flights, STS-57 and STS-58 were scheduled for June and August. They will be covered in an upcoming article.

RF

Walking-Stick Yagi?

Hold it in your hand—it's a walking stick made of aluminum with rubber ends. But inside are all the elements of a 4 element yagi that goes together in 2 minutes. Ready for the T-Hunt. Ready to get your signal out of a hole into the repeater. No little bits to drop and get lost. Everything fits clean and tight and tough. 2meters \$79, 70 cm \$49. Weighs only 1 lb. Add \$6 Shipping & Handling. Info \$1.



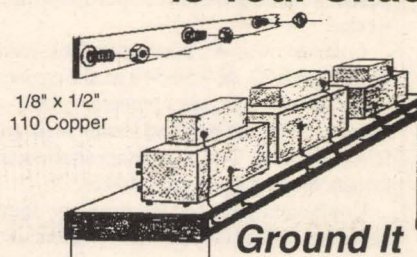
AntennasWest

Box 50062-S Provo UT 84605

Order HotLine
801 373 8425

CIRCLE 324 ON READER SERVICE CARD

Is Your Shack Grounded?



Ground all of your equipment chassis' to a single earth ground in one easy installation. Money back guarantee, if not satisfied!
J. Martin Systems

**Solid Copper Buss
Stainless Steel Hardware
Grounding Stud Every 6 Inches
Top or Back Installation**

2 ft.	\$11.95	Custom
3 ft.	\$16.95	Lengths
4 ft.	\$21.95	Available

Add \$3.00 S/H
Mail check/money order to:
J.M.S.
35 Hilltop Ave., Dept. RF
Stamford, CT 06907



ICOM

Listen to
"Let's Talk Radio"
7 nights a week
6pm to 12 pm on
Spacenet-3,
Transponder-21,
Audio 6.2

**9:00 am – 5:30 pm
weekdays**

**Weekends and evenings
by appointment.**

**VHF
COMMUNICATIONS**

453 Buffalo Street
Jamestown, New York 14701

Western New York's finest amateur radio dealer.
PH. (716) 664-6345
(800) 752-8813 for orders only

CIRCLE 14 ON READER SERVICE CARD

GET ON PACKET RADIO... FAST and EASY... With the "PC Packet Station"

By PKT Electronics, Inc.

The "PC Packet Station" is a complete packet radio station for the IBM PC including:

-> **VHF Radio Transceiver** by Motorola <-

-> **1200 baud modem** <- -> **TNC Software** <-

You just plug the PC Packet Station into a half slot in your PC, plug in your VHF antenna into the card, load the software and you're on packet, it's just that easy!

PC PACKET STATION FEATURES: * Fast, easy installation * Selectable, Com 1 through Com 4 with selectable interrupts * Built in the USA * The Radio is totally shielded from the computer * Have a custom application or a commercial use? Call us about Motorola radio modules, Motorola Telemetry Radios and Motorola Telemetry Modems. Dealer inquiries welcome.

PKT Electronics, Inc. 2668 Haverstraw Ave. Dayton, Ohio 45414 (Voice & Fax) 1-513-454-0242

CIRCLE 394 ON READER SERVICE CARD

advertiser index

RS#	ADVERTISER	PG	RS#	ADVERTISER	PG	RS#	ADVERTISER	PG
18	A.S.A.	23	182	Handie-Base	24	34	Ramsey Electronics	3
196	A.S.A.	12	179	Icom	CV4	•	73 Amateur Radio Today	13
•	Advanced Electronic Applications	CV2	283	Innotek, Inc.	23	35	Sign On	14
29	Ameco Corporation	20	•	J.M.S.	16	244	Software Systems	14
324	Antennas West	16	2	Kawa Productions	24	250	Software Systems	17
380	Antennas West	26	234	Lentini Communications	19	93	Tejas RF Technologies	19
16	Astron Corporation	9	335	Lightning Industries	24	119	Tiare Publications	23
41	Barry Electronics Corporation	18	25	Madison Electronic Supply	20	269	Tigertronics	8
105	Battery Tech, Inc.	11	101	Maxcom, Inc.	26	299	Townsend Electronics	26
184	C & S Sales, Inc.	21	86	MFJ Enterprises	5	11	Transel Tech.	7
146	Creative Control Products	14	114	Mr. Nicad	24	136	Unadilla Antenna Manufacturing Company	19
114	E. H. Yost	24	73	Orchid City Software	24	•	Uncle Wayne's Bookshelf	29
157	Echotrak	24	•	P.C. Electronics	12	•	Universal Radio	23
353	Emars	19	68	Periphex	7	•	Vanguard Labs	24
83	EUR-AM Electronics	26	394	PKT Electronics	16	14	VHF Communications	16
193	GGTE	25	110	Radio Amateur Satellite	17	104	Vis Study Guides, Inc.	24
72	Glen Martin Engineering	17	•	Radio Fun	17, 26	•	Yaesu Electronics Corporation	CV3

Are You Having Enough Radio Fun?

Are you having enough fun with amateur radio? *Radio Fun* is the *only* amateur radio magazine written especially for you – the newcomer, or any one else who wants to get more enjoyment out of amateur radio. We pack every issue of *Radio Fun* with easy to understand construction projects, interesting news and great reviews of new and vintage gear. We'll help you learn about all of the fascinating areas of amateur radio – packet, amateur television, VHF/UHF and dozens more. We'll get you fired up to try DX chasing, contests and public service. We'll even help you learn more about radio and electronics, and we'll do it in a way that everyone can understand.

So what are you waiting for? It's only \$12.97 for a whole year of fun!

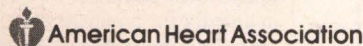
1 year – 12 issues – of *Radio Fun* for only \$12.97! That's 46% off the cover price!

Call 1-800-257-2346

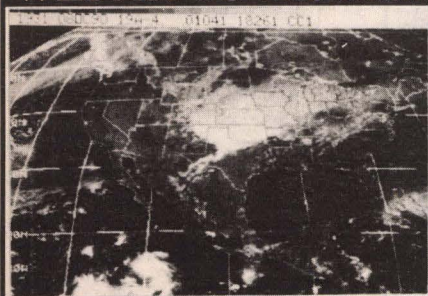
... or send your check to *Radio Fun*, P.O. Box 4926, Manchester NH, 03108 - 9839.

SUPPORT RESEARCH.

It Works Wonders.



WEFAX To The Max



PC GOES/WEFAX 3.0 \$250

PC GOES/WEFAX 3.0 is a professional fax reception system for the IBM PC. It includes an AM/FM demodulator, software, cassette tutorial and 325 page manual. Check this partial list of our advanced features:

Res. up to 1280x800x256 APT Lat/Lon. Grids
Unattended Operation Orbital Prediction
Colorization Frame Looping
Zoom, Pan, Rotation PCX & GIF Export
Contrast Control Grayscale Printing
Tuning Oscilloscope Infrared Analysis
Photometry/Histograms Variable IOC & LPM

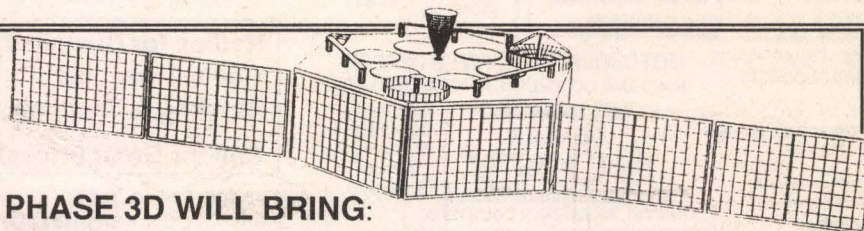
PC HF FACSIMILE 6.0 \$99

PC HF Facsimile 6.0 is a complete shortwave FSK fax system for the IBM PC. It includes an FSK Demodulator, software, 250 page manual and tutorial cassette. Call or write for a complete catalog of products.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel: (714) 498-5784 Fax: (714) 498-0568

CIRCLE 250 ON READER SERVICE CARD

Sell Your Used Gear In The RADIO FUN FLEA MARKET CALL JUDY WALKER TODAY 1-800-274-7373



PHASE 3D WILL BRING:

Space to virtually every ham through:

Higher power transmitters
Higher gain antennas
Three axis stabilization

More bands:

Downlinks on 10 Meters, 2 Meters; 70, 13, 5 and 3 Cm.
Uplinks on 70, 23 and 5 Cm.

Higher Orbit:

48,000 km. (29,000 mile), 16 hour orbit for increased coverage and visibility for many hours each day.

PHASE 3D NEEDS YOUR HELP!

A contribution of just a few dollars from EVERY active amateur will insure that this new marvel gets into orbit.

MAKE YOUR CONTRIBUTION TODAY!

You are also invited to join AMSAT and receive the *AMSAT Journal* so that you too, can follow the progress of Phase 3D and other exciting amateur satellite activities. Dues are just \$30 annually in the U.S. and \$36 in Canada and Mexico – \$45 elsewhere.



AMSAT

P.O. Box 27
Washington, D.C. 20044
(301) 589-6062
Fax: (301) 608-3410

CIRCLE 110 ON READER SERVICE CARD

ROOF-TOP TOWER

The IDEAL starter tower for EVERY new amateur radio operator. For HF arrays The RT 936 can handle 85 mph winds with a 28 square foot wing load. The lighter RT-832 handles up to 8 sq. ft. of wind load at 85 mph. With light weight and easy UPS shipping, you can have this tower up and operating on your QTH next week!

**You've wanted to put up a tower:
Now you CAN!**

Glen Martin Engineering:
Manufacturer of the HAZER tram system

Model	RT-832	RT-936
Height	8 Ft.	9 Ft.
Maximum Wind Load (Sq. Feet)	8 Sq. Ft.	28 Sq. Ft.
Shipping Weight	37 Lbs.	78 Lbs.
Price	\$189.95	\$328.75

We accept Mastercard, VISA or COD
Order yours TODAY!



Route 3, Box 322 Boonville, MO 65233
Phone 816-882-2734 Fax 816-882-7200

CIRCLE 72 ON READER SERVICE CARD

Letters continued from page 5
requirement is onerous. Beyond that, the vast majority cannot fathom the logic in a licensing scheme that promotes no identifiable service or protection to the public. The League's elitist attitude goes beyond the code issue. For

example, the League supported prohibiting Novices from operating repeaters, knowing full well that the existing rules allowed anyone in the electronically-unsophisticated general public to operate a business-band repeater. Sure, the League does a great job in many

areas. Yes, the League has finally (since the advent of *Radio Fun*) recognized that those much-feared no-coders are actually highly-motivated, money-spending amateur radio operators. Now *QST* even has a section for new hams. You can bet, however, that the motiva-

tion for that section came from the advertising manager of *QST* and not from the League's board!

As someone who served in a state legislature for over a decade, it is my opinion that it is most unfortunate that an organization that

purports to represent amateur radio is not representative of anything other than the constipated views of a few codgers on its board. If the policymakers in the FCC really knew what was going on out in the ranks of amateur licensees, we might finally see sensible change in license structure and a reasonably open mind toward new technology. Unfortunately, we're not likely to see any change until the "by God, I had to learn 20 words a minute" crowd from the '40s is gone. What a shame. The world looks to us for leadership in technology. Other countries have even emulated our amateur licensing scheme. Woe be unto them.

Look, I'm not on a tirade against the League or World War II vets. My point is that this great endeavor of amateur radio is too important to vest in the hands of an unrepresentative board. New Hampshire may have the right idea on representative democracy with its large, nonprofessional legislature and its town meetings. Let's get our public mandate clear—what is our purpose and what relevance, if any, does our licensing plan have to that mandate?

Thanks for the audience, Wayne. We talk about you on the repeaters often. I usually support you. You got guts. Thanks for saying what everybody else is thinking.

David, you're a troublemaker. Even worse, you're right.—Wayne

Peter H. Cheasley VE2TPR, Saint Laurent, Quebec, Canada A promotional article in 73 led me to subscribe to *Radio Fun* in time for the premiere issue, and got me to move myself towards becoming an amateur radio operator.

I am 57 years old and have been out of the work force for some years. Today I wrote the Advanced Technical examination successfully, thus attaining the highest license possible in Canada.

Your suggestions led to making my own tuned antenna, buying a Kenwood TS-520, visiting hamfests, etc. The knowledge gained from fabrication, retubing the rig, getting the rig to work, and the other demands that came up, provided as much knowledge as the textbooks. The articles in *Radio Fun* and the approach in the articles to each step of the journey really put fun into the labor.

This letter is to thank you for your large contribution to my venture into the world of amateur radio. Also to be thanked are the Westminster Radio School and West Island Amateur Radio Club in Ponte Claire, Quebec, and The Grand Strand Radio Club in Myrtle Beach, South Carolina, whose members were always up to solving problems with me.

Continue the great paper. **RF**

Barry Electronics Corp.

WE SHIP WORLDWIDE
WORLD WIDE AMATEUR RADIO SINCE 1950
Your one source for all Radio Equipment!



Wherever I go, I take my radio.
Specialist in RADIOS;
Business marine aviation,
ham radios and scanners.

KENWOOD



ANTENNAS
A-S, AES, Cushcraft, Hy-Gain,
Hustler, KLM, METZ, Urban,
MODUBOX, TONNA, Butternut,
Multi-Band

"TS-50S", TS450S/AT, R-5000, TS-850S,
TM 241/A441A, TR-751A, Kenwood Service
Repair, TS140S, TS690S, RZ-1, TS-790A,
TS950SD, TH-78A, TH28/48A, TM-941A,
TM-741A, TM-732A, TM-641A, TM-742A.

MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800
AVIATION PORTABLE ICOM A-21
MOTOROLA MARINE KING KX 99

Budwig ANT. Products
FLUKE 77, 83, 85, 87 Multimeters

Linear Amplifier:
Ameritron, Icom, Kenwood, Yaesu

Shortwave Receivers

- SONY • GRINDIG
- SANGEAN • ICOM

Call 212-925-7000

Satellite telephone in suitcase
for worldwide use. WRITE.

ALINCO DJ580T, 120T, 162T,
460T, 180T, F1TH, DR570T, etc.

Telephone scramblers
for cellular and regular
phones. \$299.00 each

CAR Stereo with
Shortwave
Phillips DC-777 @ \$499.95
in stock

ANTENNAS:
AEA, AlphaDelta,
ANLI, Antenna
Specialist, Barker &
Williamson,
Comet, Cushcraft,
Diamond, GAP,
Hy-Gain, Hustler,
Larsen, Etc.



(144, 220, 440
MHz), Isolooop.

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

BIRD
Wattmeters &
Elements
In Stock

**BIRD Wattmeters &
Elements In Stock**



Not available for export.

KITTY SAYS: WE ARE OPEN 7 DAYS A WEEK
Saturday 10-5pm/Sunday 11-4 pm
Monday-Friday 9 to 6:00 PM
Come to Barry's for the best buys in town



"YAESU Ham and Business Radios"

FT-767GX, FT-890, FT-747GX, FT-990, FRG-8800,
FRG-100B FT-736R, FT-1000D, FT-416/816, FT-530,
FT-5200, FT-2400, FT-470, FT-530-FT-411E

YAESU ICOM
FT-23R/26/76 IC2/3/4SAT
FT411E-811-911 IC02AT/2SRA
FT-2008/7008 IC2/4GAT/24AT
IC-A21/U16

CONTACT US FOR THE LATEST IN
BUSINESS AND HAM RADIOS,
SHORTWAVE RECEIVERS &
SCANNERS, MOTOROLA, YAESU,
ICOM, KENWOOD, ALINCO,
STANDARD, MAXON, RELM, BENDIX
KING, SONY, SANGEAN

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 A200 H.T., TAD



ICW2A
W2AT
P2AT/4AT

IC-H16/U16
IC21A

MOTOROLA RADIOS
COMMERCIAL RADIOS

TH-78A

FT-530



MOTOROLA



Antenna Tuners:
MFJ, AEA AT-300,
ICOM, KENWOOD,
YAESU.

**COMMERCIAL & HAM
REPEATERS
STOCKED.
WRITE FOR
QUOTES**

Kantronics
KAM PLUS, KPC 2/3/4,
KPC2400, SUPER FAX II,
KPC IV, Data Engine, D4-
10, etc.

Computer Interfaces
Stocked: MFJ-1270B,
MFJ-1274, MFJ-1224, AEA
PK-88, MFJ-1278T, PK-900, PK-322
MBX W/FAX, DRSI PRODUCTS
DSP 2232

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

**AUTHORIZED
DEALER**
SONY

Shortwave Radios Stocked
DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz
2300, 2210 H, 0-2200 MHz, 2600H, UTC-3000, 2810

Long-range Wireless
Telephone for export in stock

BENCHER PADDLES.
BALUNS, LOW PASS FILTERS
IN STOCK

MIRAGE/RFC Amplifiers
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

**Radios for Business,
Gov't, 2-way, etc.
Stocked & Serviced,
Call for Great Prices!**

COMET ANTENNAS
STOCKED

**HEIL
EQUIPMENT
IN STOCK**

STANDARD.



JRC Short-wave radios
JST135, NRD-535D

Hy-Gain Towers
will be shipped
direct to you
FREE of
shipping cost.

Ameritron Amplifiers
AMERITRON

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST., BETWEEN SPRING AND BROOME ST.)

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL
FAX 212-925-7001 Phone 212-925-7000

Monday-Friday 9 A.M. to 6:00 P.M.
Saturday 10-5pm /Sunday 11-2pm

IRT/LEX-"Spring St. Station". Subways: BMT-
"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave.
Station.

**COMMERCIAL RADIOS
STOCKED:** ICOM, Motorola,
MAXON, Standard,
Yaesu. We serve municipa-
lities, businesses, Civil
Defense, etc. Portables,
mobiles, bases, re-
peaters...

**ALL
SALES
FINAL**

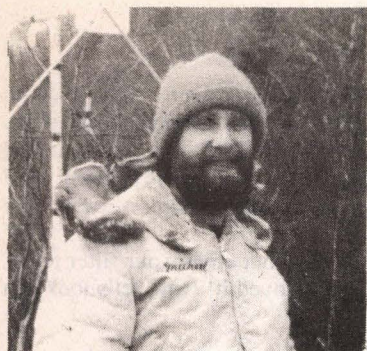
We stock: AEA, Alinco, Ameco, Ameritron, Antenna Specialist, ARRL,
Astatic, Astron, B&K, Belden, Bencher, Bird, Butternut, CES, Cushcraft,
Daiwa, Elmac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics,
Kenwood, Larsen, Maxon, MFJ, Mirage, Motorola, Nye, Palomar, RF
Products, Shure, Standard, TUBES, Uniden, Yaesu, Vibroflex, Duplexers,
Repeaters, Scanners, Radio Publications

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately.

Technical help offered upon purchase

FAX: 212-925-7001

CIRCLE 41 ON READER SERVICE CARD



the tech side

by Michael Jay Geier KB1UM

More Filters

Last month we looked at the various kinds of filters found in today's transceivers. I promised we would take a look at a new type of filter that can do all kinds of amazing things, so let's do that now.

By the Numbers

Seems like everything is going digital these days, doesn't it? Well, filters are going that way too. The buzzword is DSP (pronounced "disp"), and it stands for Digital Signal Processing and the devices used to perform it.

What's a DSP? It is a high-speed, specialized computer circuit that is designed only for one purpose: to digitize signals, perform various mathematical operations on the resulting bits and reconvert the new bit pattern to an analog signal. Although the math and theory behind this kind of processing have been known for many years, the hardware to implement it has previously been so

expensive that only the military could afford to develop and buy it (at your expense, of course). As with so many other technological developments, though, the cost has been greatly reduced through advances in chip manufacturing, allowing you to buy it for yourself.

You can do DSP with a desktop computer if you have the appropriate analog-to-digital (A/D) converter board. But to do that, you need a fairly fast computer and specialized software. Plus, you're tying up several thousand dollars' worth of hardware which you could otherwise be using for word processing or for something truly important, like Tetris.

Today, you can do DSP on one chip. This IC may operate at speeds up to 40 or more MHz, yet it can only handle the relatively low frequencies which comprise audio signals! Why does it take such a fast chip to operate on such slow signals? Well, the various operations performed on the bits require lots of steps, and we want it all to happen in

"real time." In other words, we want the chip to output signals at the same rate we input them, with only a small delay. And that's where all that speed goes.

What's Out There

DSP is such a tremendous improvement over conventional analog filters that there's no question in most cases which one is preferable. Let's take a look at the various kinds of digital filters you can buy now and how they compare to the older, analog types.

First, I should mention that DSP is not used in VHF and UHF transceivers, primarily because it just isn't needed! The widespread use of FM, combined with the basically line-of-sight, non-skipped nature of the paths, gets the modulation where it's going with little or no degradation. So, who needs all that filtering? DSP in these rigs would be a waste of money.

HF is another story. The low bands are full of noise and interference, and HF radios traditionally have included various kinds of filters, as we discussed last month. So far, though, only a few HF radios offer built-in DSP, and those are pretty limited in their use of the new technology. Internal DSPs are used to shape Morse code dits and dahs and to adjust the audio frequency response of the receiver and transmitter. Those certainly are useful functions, but most radios with no DSPs already do a pretty decent job, so why pay lots of money just to have slightly better specifications when nothing seems wrong anyway? DSP is capable of doing far more impressive things but, so far, internal units have not been pushed to anywhere near their full capabilities.

There are, however, several outboard (separate from the radio) DSP filters which operate on the audio signals you are receiving. You connect one by plugging it into the earphone or external speaker jack of your rig and then hooking up a speaker to the filter's output. (The filters also contain their own audio amplifiers.) They can do lots of remarkable things. For instance:

Notch filters: Traditional analog notch filters have a knob which you turn until the filter's resonant frequency matches the pitch of the heterodyne squeal (usually caused by some inconsiderate slob's tuning up on your frequency) you're hearing. When you match the pitch, the squeal either disappears or is greatly reduced, depending on the quality of your notch filter and the original strength of the offending signal. With a DSP notch filter, it's all automatic. The filter *automatically* senses the presence of a heterodyne and squashes it almost instantly! And the quality of the notch is much higher than an analog filter's. It's very deep, meaning that it reduces the squeal much more. And, it's very narrow, meaning that it removes only the frequency of the notch, leaving adjacent frequencies unattenuated. That results in minimal damage to the signal you're listening to, and is something no analog filter does very well.

But wait, there's more! DSP notch filters can do something truly unique: They can remove *multiple* heterodynes. Now and then you may have two or even three inconsiderate slobs tuning up at the same time, each with a different pitch. Actually, it happens all too often; I always feel like I'm on the "national tune-up frequency!" A DSP notch

Sell Your Used Gear In The RADIO FUN FLEA MARKET

CALL JUDY WALKER TODAY 1-800-274-7373

TOLL FREE 1-800-666-0908 PRICING AND ORDERS ONLY

KENWOOD



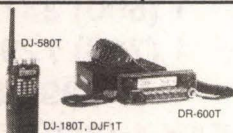
CALL FOR ALL KENWOOD

YAESU



CALL FOR ALL YAESU RADIOS & ACCESSORIES

ALINCO



CALL FOR ALL ALINCO

ICOM



CALL FOR ALL ICOM

STANDARD



CALL FOR ALL STANDARD

AEA • ASTRON • AZDEN • COMET • CUSHCRAFT • DIAMOND • KANTRONICS
MFJ • SANGEAN • SONY SHORTWAVE • DRAKE • MANY MORE...

NEW EQUIPMENT PRICING AND ORDERS 1-800-666-0908 OUT OF STATE
TECHNICAL, USED GEAR, INFO 203-666-6227 24HR. FAX 203-667-3561

LENTINI COMMUNICATIONS INC.
21 GARFIELD STREET, NEWINGTON, CT 06111

Hours: M-F 10-6, SAT. 10-4
MasterCard VISA Discover C.O.D.s OK Same Day Shipping

CIRCLE 234 ON READER SERVICE CARD

Variable Peaking Audio Filter Kits

(complete kit \$49.95 + S&H) and many other fun kits!

Send \$1.00 for our new kit catalog.

TEJAS RF TECHNOLOGY
P.O. BOX 720331
HOUSTON, TX 77272-0331
PH (713) 879-9300
FAX (713) 879-9494

CIRCLE 93 ON READER SERVICE CARD

CHEST HARNESS and BELT HARNESS



- Zippered/Padded Pocket for pens, note pads, extra battery, etc.
- Radio held chest height for hands free listening without earpiece

.....\$29.95

Both harnesses are MADE in USA of 1000 Denier padded Cordura® from Dupont, with Velcro® adjustments to fit almost any size Handie-Talkie. Weatherproof, they won't deteriorate or rot from Rain, Snow, or Perspiration.

BELT HARNESS

Handy for everyday use in carrying your Handie-Talkie on the belt.....\$18.95

Quantity Discount Available
+\$3.50 S/H TX Res. +7.25% Sales Tax

Send Check or Money Order (USD)

EMARS

PO Box 781204 San Antonio TX 78278-1204
Info: (210)493-7546

CIRCLE 353 ON READER SERVICE CARD

Sell Your Product In RADIO FUN

CALL PAUL SEPPALA TODAY! 1-800-274-7373

UNADILLA ANTENNA MANUFACTURING CO.
PO Box 4215 BV Andover MA 01810

(508) 474-8949
24 Hour FAX



W2AU
(1:1 & 4:1)

THE BIG SIGNAL
Amateur Antenna Baluns

For over 20 years, preferred by Amateur, Military and Commercial Operators. Assembled with all stainless steel hardware and a built-in lightning arrester minimizes your TVI, maximizes your power.

(508) 475-7831
9-5 EST M-F



W2DU
(HF&VHF)

Transformer Baluns

For medium power (1000 watts RF minimum) and broadband operation 3-40 MHz.

W2AU 1:1

50/50 or 75/75Ω
Dipoles, V's
Beam Models, Quads

W2AU 4:1

200/50 or 300/75Ω
Hi-Impedance Antennas
(ie: Folded Dipoles)

Non-Transformer Baluns

W2DU-HF
1.8-30 MHz
3000-9000W
1500-5000W

W2DU-VHF
30-300 MHz
2000-4000W
1200-2400W

Contact Your Local Ham Dealer Today!!!

Baluns • Antenna Kits • Filters • Center Insulators • ENDsulators™ • Coaxial Relays
All products come with a 30 Day Warranty

-NOTICE-

We are the **NEW** manufacturers of the original
JAMES MILLEN™ Products
(508) 975-2711 9am-5pm EST M-F

CIRCLE 136 ON READER SERVICE CARD

filter can track and remove as many of these annoyances as may come along. On a busy, noisy band, the result can be amazing.

Peak filters: These let you pick out a particular audio frequency and amplify it while cutting all others off. They're mostly used for CW (Morse code), because it only has one pitch anyway. Conventional analog peak filters work, but they have a tendency to "ring," or self-excite, at their tuned frequency. Not that they'll actually make a continuous tone by themselves, but background static and noise tend to take on the tuned pitch, and received CW gets muddy and difficult to copy. I have a peak filter on my rig and I avoid using it because it is actually easier to copy without it, even in the presence of other signals. With a DSP peak filter, there is no ringing. Signals don't sound muddy. You hear only what you want to hear.

Bandpass restrictors: Traditional methods of narrowing the passband use one or two knobs which let you squeeze the range of receivable frequencies. Some systems permit you only to adjust the low end or high end but not both at the same time, while others make you cut them both together. The best ones let you adjust the two sides of your passband independently, with separate knobs.

The object, of course, is to try and reduce or eliminate an interfering signal which is located near one side of the frequency of the one you want.

DSP bandpass filters do the same thing, only better. The prime difference is that the digital filters have tremendously steeper skirts. By that I mean that their response outside the selected limits falls off much faster, resulting in your getting only the signal you want.

The Ultimate

So far, all the DSP filters I've described are merely much better versions of already existing analog filter functions. They're great, but they involve many of the same compromises the analog filters do, except that the digital ones don't damage your intended signal as much. There is, however, a new kind of filter that simply can't be made with analog components. It's a voice filter intended for SSB reception, and it actually analyzes the audio waveform and looks for harmonic patterns consistent with human speech. Anything that doesn't fit gets chopped off, even if it's within the same band of frequencies. And, the thing can tell the difference between normal speech signals and the

"monkey chatter" or grumbling sounds caused by adjacent stations. I haven't actually had the pleasure of using one of these beasts, but a friend of mine has and he says it is amazing, making 20 meters sound almost like telephone conversation. Can you imagine? I sure can't but I'd like to try!

A Drawback

While many of the analog filters operate in the IF (intermediate frequency) stages of your receiver, today's DSPs aren't fast enough for that, so they work on the audio signal after it's been demodulated. Does it matter? Well, it can. The beauty of filtering at the IF level is that the receiver's AGC (automatic gain control) is not affected by signals the filter removes.

For instance, let's say you're working a weak station on CW. Some other station starts calling CQ on a frequency only a couple of hundred Hz away from yours, and that one is 10 over 9. If you use an IF-level notch filter to take the interfering station out, your AGC will not clamp down and squash the weaker signal every time the big guy hits his key. If, however, you use an audio filter, the AGC will clamp down (because it senses the signal before the filter has a chance to remove it) and you will have great trouble copying your intended station. Therefore, IF filtering is better.

So why use a DSP audio filter? For one thing, not all interference scenarios include strong offending stations. For another, sometimes the AGC action isn't bad enough to be a problem. But mostly, DSPs are worth using because they work so well that the improvement more

than offsets the disadvantage.

The Future

As DSP chips get even faster, IF-level filtering will become common. At that point, I expect to see DSP filters becoming standard features on the more expensive HF rigs. I expect to start seeing it within five years.

Well, that about covers our filter topic. I hope you enjoyed it! Now, let's look at a letter:

Dear Tech Side,

I just read your article on packet radio in the March issue. I have a hardware TNC, but the software approach really intrigues me, especially because the software that came with my TNC is somewhat hard to use. Where can I get a copy of Poor Man's Packet or EZPacket?

Signed,
Curious

Dear Curious,

Both programs are available for download from the 73 Magazine bulletin board system, and they're free. To use either of them, you'll need a packet modem, which you can buy for about \$50 from several vendors advertising in the magazine. You can also build one yourself. Especially if you want to operate portable packet with a walkie and a laptop, the software approach is great. If you want very advanced features and/or don't want to tie your computer up, though, a hardware TNC is still the way to go.

73 and see you all next time, from KBIUM. **RF**

Move Up In Class with **AMECO** Books and Code Courses

Upgrade your ticket with Ameco's help.



FCC Test Manuals contain all the latest, official FCC/VEC test questions with answers. Plus, easy-to-understand discussion of each correct answer. Excellent preparation for all classes of amateur exams.

Novice Class	Cat. #27-01 ...	\$5.95
Novice Class Theory Course	Cat. #23-01 ...	\$6.95
Technician Class	Cat. #28-01 ...	\$5.95
Codeless Technician Class	Cat. #78-01 ...	\$9.95
General Class	Cat. #12-01 ...	\$5.95
Advanced Class	Cat. #26-01 ...	\$5.95
Extra Class	Cat. #17-01 ...	\$5.95

With our help, learning code is easy.

Ameco Code Courses on cassette tapes to help you prepare for the code test at the next level.

Novice Course (0-8WPM) Cat. #100-T ... \$5.95

Senior Course (0-18WPM) 2 tapes Cat. #101-T ... \$10.95

Advanced Course (8-18WPM) Cat. #103-T ... \$5.95

Extra Class Course (13-22WPM) Cat. #104-T ... \$5.95

General QSO Course Cat. #105-QT ... \$5.95

Extra QSO Course Cat. #106-QT ... \$5.95



Code Course for the PC for IBM PC/XT/AT or compatible. User friendly, random characters, send text from external data files, quiz sessions, all at any speed and tone. Includes Code learning book. (Specify 5-1/4" or 3-1/2" disk) Cat. #107-PC ... \$19.95

You can find AMECO books and tapes at your local amateur radio dealer.

AMECO CORPORATION

224 East Second Street ■ Mineola, NY 11501
Tel: (516) 741-5030 ■ Fax: (516) 741-5031

All products available directly, please add \$2.75 for S & H.
Please write or call for complete catalog and price list.

CIRCLE 29 ON READER SERVICE CARD

**Sell Your Product in
Radio Fun!**
Call Paul Seppala
today at 1-800-274-7373.

Subscribe
to
**Radio
Fun**
by
calling

1-800-257-
2346.

Don't Miss
a Single
Issue!

Call
Today.

★
**MADISON
SHOPPER**
★

ORDERS:

1 (800) 231-3057

1 (713) 729-7300

or 729-8800

FAX 1 (713) 729-4766

New and Used Meters,
Tubes, Transformers,
Filter Capacitors



And More
FREE List Call



Madison Electronics

12310 Zavalla Street
Houston, TX 77085

CIRCLE 25 ON READER SERVICE CARD



radio magic

by Michael Bryce WB8VGE

Modifying Our Keyer

If there is one thing hams are really good at, it has to be modifying equipment. This month we'll look at some of the ways we can improve the performance of the keyer we have put together.

The place to start is the speed of the clock circuit. As you recall, by slowing the keyer's clock down, we make the output to the flip-flops slower and thus produce dots and dashes at a slower rate. The reverse is true when the clock is speeded up. A faster clock produces faster dots and dashes for the transmitter.

If you're just starting in ham radio, your code speed still may not be up to the slowest speed setting on our keyer. So, the fix is a simple one—we'll slow the keyer's clock down.

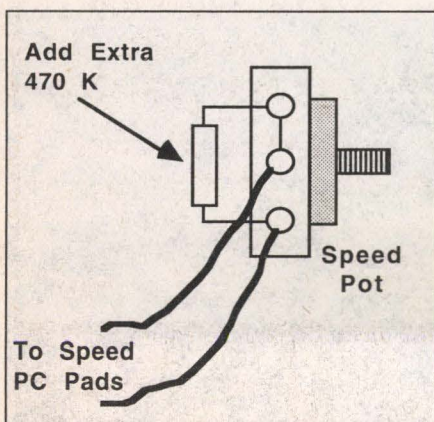
Slowing Down the Clock

We can do this in two ways: We can add more capacitance to the oscillator, or we can add more resistance to the oscillator. Either one will work, and either one is just about as simple to do. Let's look at adding some extra capacitance to the oscillator first.

All you have to do is tack solder an extra 0.1 capacitor on the foil side of the PC board in the location marked by C1. Cut the leads of a 0.1 capacitor about 1/4 inch long and pre-tin the leads with some solder. Now, press on one lead of the capacitor across one pad of C1 and solder the connections until the two melt into one joint. It's not hard to do, but it is tricky to get enough heat on the junction without cooking either component. When one lead is soldered in place, do the same for the other lead. Make sure you have not created any solder bridges or shorted out the two pads for C1 with the extra capacitor leads. By adding a second 0.1 capacitor, we have slowed the clock down and thus the keyer will produce slower dots and dashes.

If you happen to have a 0.2 capacitor laying around in the junk box, that's great! You can remove the 0.1 located at C1 and tack solder the 0.2 capacitor across C1. In either case, you'll slow the clock down.

If soldering extra capacitors to the back of the PC board is not your cup of tea, then you can change out the speed pot and do the same thing. Instead of using a 470k pot, you may use a 1 megohm pot. The results will be the same as be-



fore, with the addition of an extra C1. If you really want a *slow* keyer, then you may want to add extra capacitance and more resistance to the oscillator. If you add too much capacitance to the oscillator you'll cause it to stop running all together. Don't go too crazy with extra capacitance across C1.

Speeding Up the Oscillator

If, on the other hand, the keyer is too slow, you can speed up the oscillator by changing out C1 to a smaller value. A good start would be to replace the 0.1 capacitor with a 0.01 capacitor. You'll need some solder wick to suck up the solder and remove the old 0.1 capacitor. Replace C1 with the 0.01 and you're ready to go. If you don't want to mess with replacing C1 then you can decrease the value of the speed control. By lowering the resistance, you'll speed up the oscillator. The only trouble with this notion is the next available value is generally 100k.

That's a real drop from the 470k normally used. We can make a small "fix" to the pot we're now using by adding a second 470k across the two outside connections (see Figure 1). By adding this resistor in parallel, we have effectively lowered the overall resistance of the pot. Less resistance equals a faster clock equals faster dots. By using either one of these tricks, you should now be able to customize the speed of our keyer project to suit your own needs.

Improving the Key Line

The next modification will be to the key line. We'll start by adding a small dip reed relay. A reed relay contains a glass-enclosed reed surrounded by a coil of wire. When an electric current passes through the coil, it becomes an electromagnet. This closes the "reed" and completes an external circuit. In our case, it closes the key line to ground, keying the transmitter on.

Reed relays are very fast. They can easily follow the fastest CW operator around. I've used them for keying RTTY tone generators for years. They're also very quiet. You'll really have to listen to hear them switch on and off. Another feature of the reed relay is their small size and low current consumption. They do have a downside, too. A reed relay can't switch a lot of current. Try and switch too much current and the reed will weld itself close.

So, what's the purpose of using a reed relay anyway? Well, first you can let the reed relay key the transmitter instead of using the switching transistor on the keyer's PC board. Some rigs don't like to see a switching transistor and may key badly, causing chips and clicks to appear on your signal. The reed relay will supply a direct connection to ground and thus key the rig as well as a straight key or bug would. The reed relay will also provide isolation between your home-brew key-

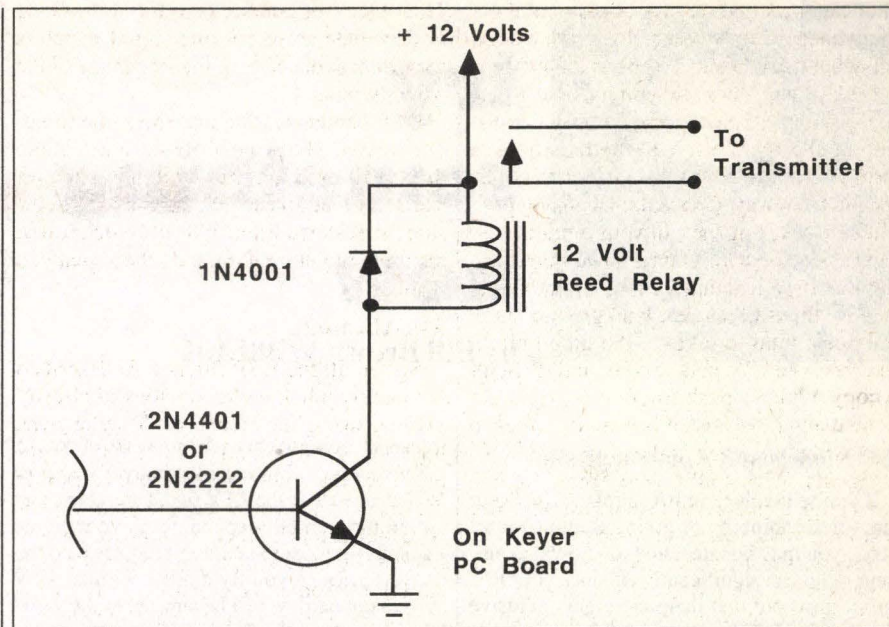


Figure 2. This simple relay circuit will key your transmitter fast.

er and the \$1,800 transceiver you just brought. If your keyer goes up in smoke, it won't take the transceiver with it because the reed relay is between the keyer and your rig. There is no direct connection between the two.

Radio Shack sells several different types of reed relays for under \$2. Take a look at the schematic to see how you connect the relay up

to the keyer. Notice the 1N4001 diode across the relay's coil. This diode protects the switching transistor on the keyer board from the high voltage produced when the relay coil collapses. Don't neglect to add this diode.

That's about all this month. Next time we meet, I'll have plans for a simple folded dipole for one of my favorite bands—30 meters. **RF**

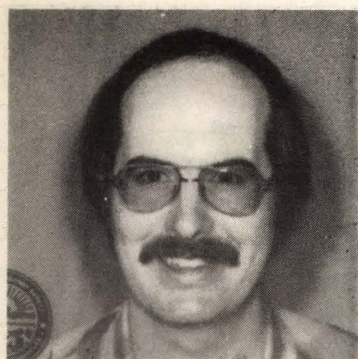
ELENCO & HITACHI & B+K PRODUCTS AT DISCOUNT PRICES

TO ORDER CALL TOLL FREE 1-800-292-7711
1-800-445-3201 (Can.)

ELENCO OSCILLOSCOPES S-1325 25MHz \$349 Dual Trace Oscilloscope S-1340 40MHz \$495 Dual Trace Oscilloscope S-1360 60MHz \$775 Dual Trace, Delayed Sweep • Automatic beam finder • Built-in component tester • 1mV sensitivity • Dual time base	B+K OSCILLOSCOPES 2120 - 20MHz Dual Trace \$395 2125 - 20MHz Delayed Sweep \$539 1541B - 40MHz Dual Trace \$749 2160 - 60MHz Dual Trace, Delayed Sweep, Dual Time Base \$949 2190 - 100MHz Three Trace Dual Time Base, Delayed Sweep \$1,395 2522 - 20MHz / 10MS/s Storage \$895 1442 - 20MHz Portable \$1,229 1443 - 40MHz Battery / AC operated with Cursor & Readouts \$1,439	Hitachi Compact Series Scopes V-212 - 20MHz Dual Trace \$409 V-525 - 50MHz, Cursors \$975 V-523 - 50MHz, Delayed Sweep \$949 V-522 - 50MHz, DC Offset \$849 V-422 - 40MHz, DC Offset \$749 V-222 - 20MHz, DC Offset \$625 V-660 - 60MHz, Dual Trace \$1,095 V-665A - 60MHz, DT, w/cursor \$1,325 V-1060 - 100MHz, Dual Trace \$1,375 V-1065A - 100MHz, DT, w/cursor \$1,649 V-1085 - 100MHz, QT, w/cursor \$1,995 V-1100A - 100MHz, Quad Trace \$2,195 V-1150 - 150MHz, Quad Trace \$2,695
Digital Capacitance Meter CM-1550B \$58.95 9 Ranges 1pF-20,000pF 5% basic acry. Zero control w/ Case Big 1" Display	Digital LCR Meter LC-1801 \$125 Measures: Coils 1uH-200H Caps 1pF-200uF Res. 0.1-20M	Multimeter with Capacitance & Transistor Tester \$55 CM-1500B Reads Volts, Ohms, Current, Capacitors, Transistors and Diodes / w/ case
Quad Power Supply XP-580 \$69.95 2-20V @ 2A 12V @ 1A 5V @ 3A -5V @ 5A Fully regulated and short circuit protected	Triple Power Supply XP-620 Assembled \$75 Kit \$75 2 to 15V @ 1A -2 to -15V @ 1A (or 4 to 30V @ 1A and 5V @ 3A)	AM/FM Transistor Radio Kit with Training Course Model AM/FM 108 \$27.95 14 Transistors • 5 Diodes Makes a great school project
Sweep/Function Generator with Freq. Counter \$259 Model GF-8026 Sine, Square, Triangle, Pulse, Ramp 2 to 2MHz, Freq Counter 1-10MHz Internal Linear & Logic Sweep	Function Generator Blox #9600 \$28.95 Provides sine, triangle, square wave from 1Hz to 1MHz AM or FM capability	FLUKE MULTIMETERS (All Models Available Call) Scopes Model 93 \$1,225.00 Model 95 \$1,540.00 Model 97 \$1,795.00 Model 10 \$62.95 Model 12 \$79.95 70 Series Model 7011 \$65.00 Model 7711 \$145.00 Model 7911 \$169.00 80 Series Model 87 \$289.00
Learn to Build and Program Computers with this Kit Includes: All Parts, Assembly and Lesson Manual Model MM-8000 \$129.00 Starting from scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC.	Elenco Wide Band Signal Generators SG-9000 \$129 RF Freq 100K-450MHz AM Modulation of 1KHz Variable RF output SG-9500 w/ Digital Display & 150 MHz built-in Counter \$249	True RMS 4 1/2 Digit Multimeter M-700T \$135 .05% DC Accuracy .1% Resistance w/ Freq. Counter Data Hold
WK-500 Digital / Analog Trainer A complete mini-lab for building, testing, prototyping analog and digital circuits Elenco's Digital/Analog Trainer is specially designed for school projects, with 5 built-in power supplies. Includes a function generator with continuously variable, sine, triangular, square wave forms. All power supplies are regulated and protected against shorts. Power Supplies: • Variable Power Supply • +1.25 to 20VDC @ 5 Amp • +1.25 to 15VDC @ 1 Amp • +1.25 to 30VDC @ 5 Amp • +1.25 to 15VDC @ 1 Amp • +12VDC @ 1 Amp • -12VDC @ 1 Amp • -5VDC @ 1 Amp • 30VAC Center tapped @ 15VAC @ 1 Amp Analog - Section: • Function Generator Sine, Triangular, Square wave forms • Frequency adjustable in five ranges from 1 to 100KHz • Fine frequency adjust • Amplitude adjust • DC offset • Modulation FM-AM Digital - Section: • Eight data switches • Two no bounce logic switches • 8 LED readouts TTL, buffered • Clock frequency 1 to 100KHz • Clock amplitude 5VPP square wave Breadboards: • 2 breadboards, each contain: 640 tie points (total 1,280) Assembled \$159.95 \$129.95 Kit		

WE WILL NOT BE UNDERSOLD C&S SALES INC.
 UPS SHIPPING: 48 STATES 9% 1245 ROSEWOOD, DEERFIELD, IL 60015
 IL RES 7.5% TAX (\$3 min \$10 max) FAX: 708-520-0085 • (708) 541-0710
 PROBES INCL ALL SCOPES & METERS

Figure 1. One way to speed up the oscillator is to decrease the value of the speed pot resistance.



try something new

by Bill Brown WB8ELK

R/C Models and Amateur Radio

If you're involved in R/C airplanes, boats or cars (or are thinking of giving Radio Control a try), you may be interested to know that amateur radio can significantly enhance your R/C fun. It turns out that there are eight exclusive (hams only) R/C frequencies that you can use in the 6 meter band (see Table 1 for a list of these R/C aircraft frequencies). When purchasing a new R/C system, you can usually custom order one of these ham frequencies. When shopping around, keep in mind that a few manufacturers do not support the ham channels. Although you are still limited to 1 watt output power on the R/C transmitter, you now have an excellent "clear channel" advantage when you fly at an R/C field or meet. Unless other hams are in your flying club, you won't have to worry about other planes operating on your control frequency. Even at the larger flying meets, the chances of your 6 meter frequency conflicting with others will be small.

Visual and Audio Accessories

Although it's sure a lot of fun to fly a model plane, wouldn't it be great to put a TV camera onboard and actually see the world from your model's perspective? Using commonly available ham ATV (amateur television) equipment, you can now do just that. All you need inside your model is a miniature TV camera looking out the window or through the fuselage, angled toward the ground, a small ATV transmitter (usually operating on the 450 or 900 MHz bands) and a small antenna mounted in the tail. You may have to shield your R/C receiver with some foil and maybe an RF choke or two to keep the ATV signal from interfering with your control uplink. Just a few years ago this TV system would've weighed a few pounds and only the largest of R/C planes would be able to lift it. Now, with the latest in miniature cameras and transmitters, the transmitter and TV camera only weigh a few ounces. Even small models can now take this system up.

To receive the TV signals, you need either an omnidirectional whip antenna or a small beam, a downconverter to translate the ATV

frequency down to channel 3 or 4 and, of course, a TV receiver. Some cable-ready TV sets or VCRs can tune in the ATV signal on cable channel 56 through 60 (depending on your actual transmit frequency) and don't require a downconverter. Once you fly a plane with an ATV system onboard, you'll be amazed at the view! When watching the TV downlink, you can actually fly the model without looking up at the plane itself. It's more like the real thing, since you are visually riding along inside the model plane.

Flight Simulator R/C

A number of ham operators have taken this system to elaborate extremes. Carl Berry K5MWN of Abilene, Texas, put a color TV camera and ATV transmitter inside his Robin Hood 99 plane. He created his own flight simulator control system by installing his ATV receiver and TV set inside of an old video racing game he bought used from an arcade (see Photos A and B). The game provided Carl with the framework for his simulated cockpit. It had a comfortable seat, foot pedals and space for his TV set. He hooked up a joystick and throttle controls and interfaced the foot pedals for rudder and aileron controls. After wiring these controls to his R/C transmitter, he had a fully functional cockpit which could control his plane. Carl can take his plane off, fly in formation, do aerobatics and even land his plane without ever looking at the model itself, all from the comfort of his home-brew cockpit. In case of loss of video signal, he can pass control over to another R/C modeler who can keep an eye on the model and can take control of his plane if necessary.

An Airborne VHF Repeater

Larry Hillier N8EWV of Beloit, Ohio, has added another twist to his R/C plane. In addition to his onboard TV camera, he installed a 2m HT (ICOM 2AT) and the lightweight U.S. Digital Simplex Repeater controller (see Photo C). He can fly his plane up to 500 feet and allow area hams to use his plane as an airborne 2 meter repeater. [Note: A simplex repeater operates on one frequency—it digitally stores the

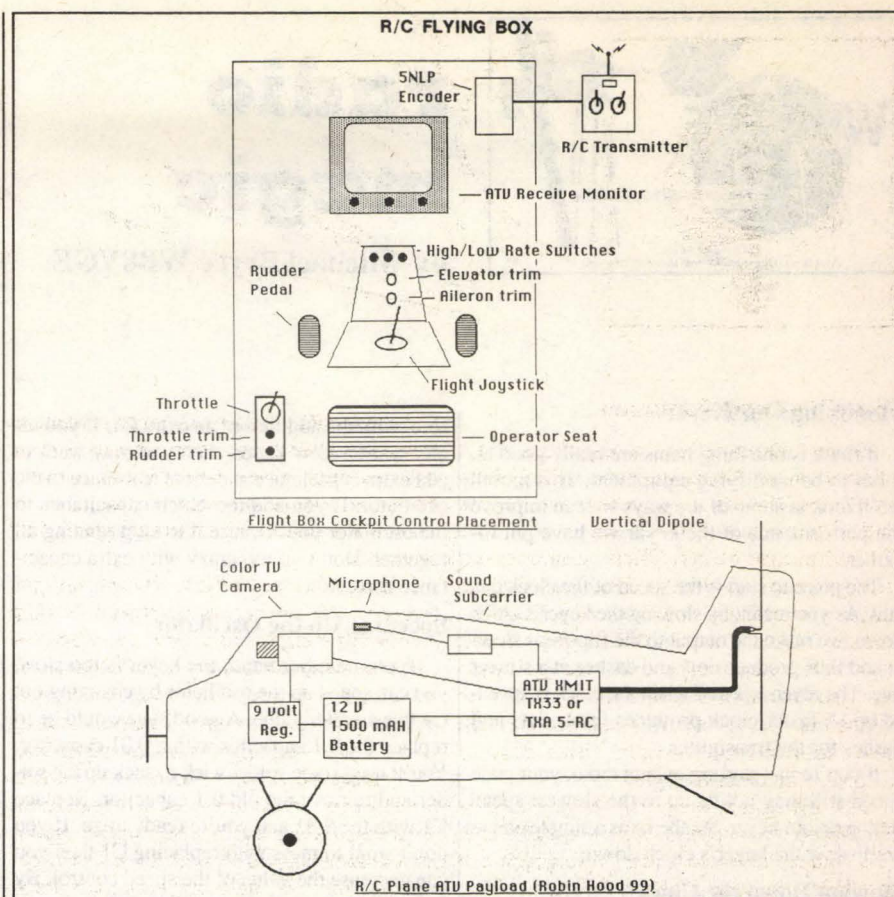


Figure 1. Diagram of the K5MWN R/C flight simulator system.

received voice signal and retransmits it when the station is done talking.] Everyone has a blast when Larry flies his repeater plane. Several contacts over 100 miles have been made using the plane as a relay. During one flight, Larry repeated through his plane to talk to several stations in West Virginia (over 100 miles away). N8GHQ in Wheeling, West Virginia, actually made it into the plane with his HT (using a rubber duck antenna).

Air, Land or Sea

Any of these ideas can be applied to R/C cars, boats or even robots. One practical ap-

plication could involve using a video-equipped robot to roam about hazardous areas during emergencies. I think you'll enjoy the fascinating world of Radio Control (complete with ham radio accessories).

RF

Table 2. ATV Equipment Suppliers for R/C

P.C. Electronics
2522-WG Paxson Lane
Arcadia CA 91007
(818) 447-4565

Micro Video Products
1334 S. Shawnee Dr., Dept. H
Santa Ana CA 92704-2433
(800) 473-0538 Orders
(714) 957-9268 Technical info.

Simplex Repeater
U.S. Digital Co.
380 Rougeau Ave.
Winnipeg, MB.
Canada R2C 4A2
(204) 661-6859

Table 1. Amateur Radio R/C Airplane Frequencies

53.100 MHz
53.200
53.300
53.400
53.500
53.600
53.700
53.800



Photo A. Carl Berry K5MWN with his quarter-scale Robin Hood 99 R/C plane. It carries a color TV camera and amateur television transmitter.



Photo B. Carl Berry K5MWN can fly his R/C plane from this flight simulator cockpit (a converted arcade racing game seen in the background).



Photo C. Larry Hillier N8EWV with his simplex VHF repeater R/C plane.



Joe Carr

antennas, etc.

by Joseph J. Carr K4IPV

Hanging Loop Antennas

In this column we've covered various kinds of small loops. These antennas include both small, multi-turn loops where the length is less than one-tenth of a wavelength ($L < 0.1\lambda$), and loopsticks. These antennas are used primarily for radio direction finding and for interference nulling in the low frequency bands. They find their greatest use at 40 meters and under, but even at 40 meters, performance is less than it is at 75 or 80 meters. In this month's column we will take a look at large loops, i.e. those that are 1λ or 2λ in overall length.

The principal way the large loop is familiar to most readers is in the quad beam. The "quad" is two or more 1λ loops placed parallel to each other. Like other beams, there are driven elements, reflector elements and director elements. But those antennas are a bit dicey to build, and kits are easily available from manufacturers.

The single loop antenna offers little or no gain, and indeed may offer some loss compared to a dipole, but it can fit into locations that are too small for dipoles. If the loop is circular, then the gain might actually be the same as, or a bit more than, the standard half-wavelength dipole, but in this article we are going to look at square loops.

Some people mount square loop antennas on a tower with a rotator and all the fittings.

I often wondered about that arrangement because it seems to me that it is just as easy, and not much more expensive, to mount a full-sized two-element quad beam. Here we look at the matter of hanging square loop antennas.

Figure 1 shows the basic (if idealized) pattern for a 1λ square loop antenna. It is the classic figure-eight pattern (similar to dipoles), with the two main lobes perpendicular to the plane of the antenna. There are also two nulls off the sides of the loop. Figure 1 is a top view, so the loop appears as a straight line.

Contrast the Figure 1 pattern to that of a small loop ($<0.1\lambda$) and you will find an interesting difference. In the small loop antenna that's typically used for radio direction finding, the nulls are perpendicular to the antenna plane, i.e. 90 degrees out from the pattern of the large loop shown in Figure 1.

Because the hanging loops are not rotatable, they tend to "fire" in one direction. A solution to the problem is to use a pair of large loops arranged at right angles to each other, as shown in the two configurations in Figure 2. In Figure 2A the loops are close together, but adjoining each other at the ends. In Figure 2B, on the other hand, the loops are intersected at their centers. This configuration allows them to be hung from the same support above the

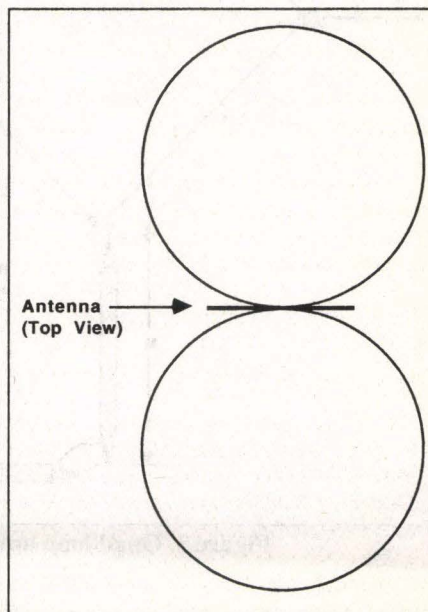


Figure 1. Radiation pattern for a hanging loop antenna.

antennas. In both systems, there is no electrical connection between the two antennas. The coaxial cable transmission lines are brought into the shack separately and then routed to a coaxial switch that can select

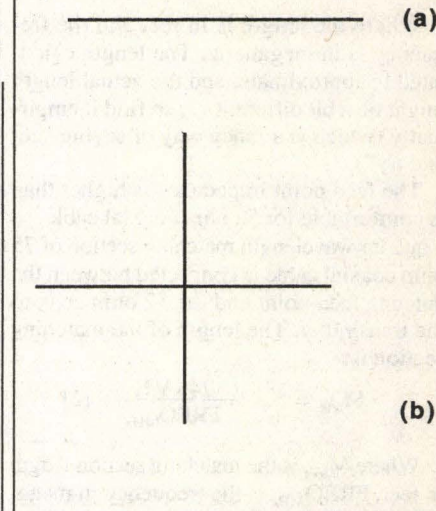


Figure 2. Covering all around the compass is possible when two loops are hung at right angles: A) end-to-end method; B) intersected version.

either antenna while excluding the other.

Quad Loop

The quad loop in Figure 3 is essentially a "single element quad beam" (if that were possible), and it is very similar to the driven element of the quad beam. In this antenna, the polarization is vertical, and the transmitter is connected to the bottom corner of the square loop. The top corner is support-

HUGE NEW CATALOG

Call or write Universal today to receive your free 100 page catalog with prices!

- Communications Receivers
- Portable Receivers
- Amateur Transceivers
- Amateur & SWL Antennas
- Scanners
- RTTY and FAX Equipment
- Books and Manuals
- All major lines: Kenwood, Icom, Yaesu, Alinco, MFJ, Japan Radio, AEA, Sony and Sangean.

This catalog is available FREE by fourth class mail, or for \$1 by first class mail.



Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Tel. 614 866-4267
◆ Tel. 800 431-3939
◆ FAX 614 866-2339

Universal-quality equipment since 1942!

Wayne is mad as hell ... and he doesn't want you to take it anymore!

Declare War! On Our Lousy Government

Fed up with the mess in Washington? The mess in your state capital. Poverty, crime, our failing schools? Wayne Green has solutions. Clever solutions.

Wayne Green's unique reasoning is intriguing — even delightful. Whether you are horrified by his proposals or you embrace them, it is impossible to ignore the basic lesson he presents: It is time to bring logic — not emotions — to bear on America's dilemmas. His spin on America in the 90's helps us to understand how

simple the seemingly complex issues are. All it takes is looking at them from an entirely new viewpoint.

Now available in one complete volume, *Declare War!* is full of thought provoking ideas and solutions to some of the most difficult problems facing our country today. Regular price: \$12.95

Special For RF Readers only — \$10.00 (plus \$3.50 shipping & handling)

Order Toll Free: 800-234-8458

THE FAMED 2 METER A. S. A. 9209

+9 db Co-Linear "MultiWave" Base Station Double 5/8 over 1/4 wave delivers up to +9 db gain. All fiberglass & solid aluminum construction. Fits masts up to 1-1/2". 2 Meter Base Station 10' length.

\$32.43

+ \$5.00 S&H

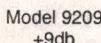
(SC RES. 5% SALES TAX)

CHECK IN ADVANCE OR C.O.D.

ALSO AVAILABLE IN 220 & 440

ASA

"Service is the Reason For Our Success"



Model 9209
+9db

Tel: (803)293-7888 P.O. Box 3461
Watts: 1-800-722-2681 Myrtle Beach, SC 29578

CIRCLE 18 ON READER SERVICE CARD



X-BAND TRANSMITTER

Miniature (2 1/4 x 3 3/4 x 1") GaAs microstrip transmitter provides

10 dBm centered at 10.525 GHz. Integrated microstrip patch antenna eliminates the need for an external antenna. Advanced matching techniques secured good temperature stability with low frequency pulling. Great for long-range testing of radar detectors, calibration of radar receiving equipment, and point-to-point communication links.

Complete Assembled System \$39.00

Parts & Instruction Kit \$29.00

Plus \$2.00 Shipping and Handling

INNOTEK Inc.

P.O. Box 80096, Fort Wayne, IN 46898

(219) 489-1711

Visa • MasterCard • Check • Money Order • COD

Money-Back Guarantee

CIRCLE 283 ON READER SERVICE CARD

GREAT RADIO READS!

TIARE

PSE QSL - An Expert's Guide to Amateur Radio QSL'ing \$ 9.95

Ham Radio Contesting the thrills 'n chills \$14.95

The RV Antenna Manual antennas for your RV \$14.95

World Ham Net Directory over 900 nets \$ 9.95

\$ U.S. only.

Add \$2 s/h (\$3 foreign) plus

\$1 each additional book.

VISA/Mastercard welcome.

Catalog \$1 (free with order).

Order Now

Tiare Publications

P.O. Box 493

Lake Geneva, WI 53147

CIRCLE 119 ON READER SERVICE CARD

ed from an overhead structure—such as a tree limb, roof line, or wooden mast—with an end insulator and a rope. Similar insulators and ropes keep the side corners stretched; these must be connected to side supports such as a house, tree trunk or wooden pole.

The overall length of the antenna, which includes all four sides of the square, is found approximately from:

$$L_{\text{feet}} = \frac{1005}{\text{FREQ}_{\text{MHz}}} \quad [1]$$

Where the length is in feet and the frequency is in megahertz. The length calculated is approximate, and the actual length might be a bit different . . . so find it empirically (which is a fancy way of saying "cut and try").

The feed point impedance is higher than is comfortable for 52 ohm coaxial cable, so a quarter wavelength matching section of 75 ohm coaxial cable is connected between the antenna feed point and the 52 ohm coax to the transmitter. The length of the matching section is:

$$M_{\text{feet}} = \frac{246 \text{ V.F.}}{\text{FREQ}_{\text{MHz}}} \quad [2]$$

Where M_{feet} is the matching section length in feet, FREQ_{MHz} is the frequency in megahertz, and V.F. is the velocity factor of the coaxial cable. The V.F. figure is typically 0.66 for polyethylene coax and 0.80 for poly-foam cable.

Bi-Square Loop

Figure 4 shows the bi-square loop, which is a 2λ loop, fed at the bottom corner and open-circuited at the top corner. The bi-square loop reportedly can exhibit up to 4.5 dB gain over a dipole, although it is normally the case that somewhat less is actually achieved. The overall length (L) of the antenna is two wavelengths, so each side is half a wavelength:

$$L_{\text{feet}} = \frac{1964}{\text{F}_{\text{MHz}}} \quad [3]$$

A matching section made of parallel transmission line, i.e. two #14 conductors separated by 4 inches, is used to match the

impedance of the antenna feed point to the 50 ohms required by the antenna. The length (M) of the stub is:

$$M = \frac{235}{\text{FREQ}_{\text{MHz}}} \quad [4]$$

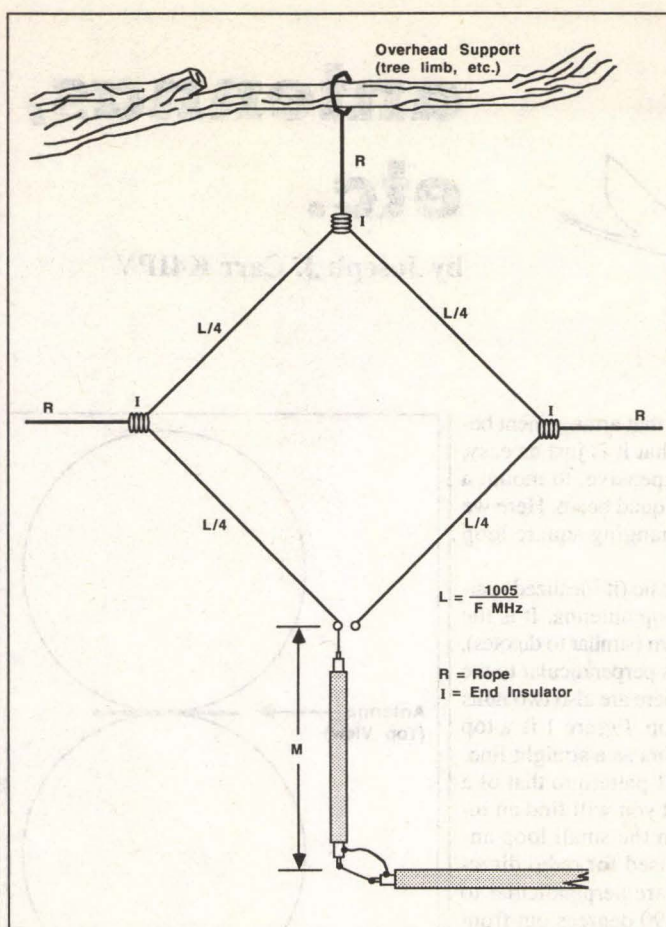


Figure 3. Quad loop antenna.

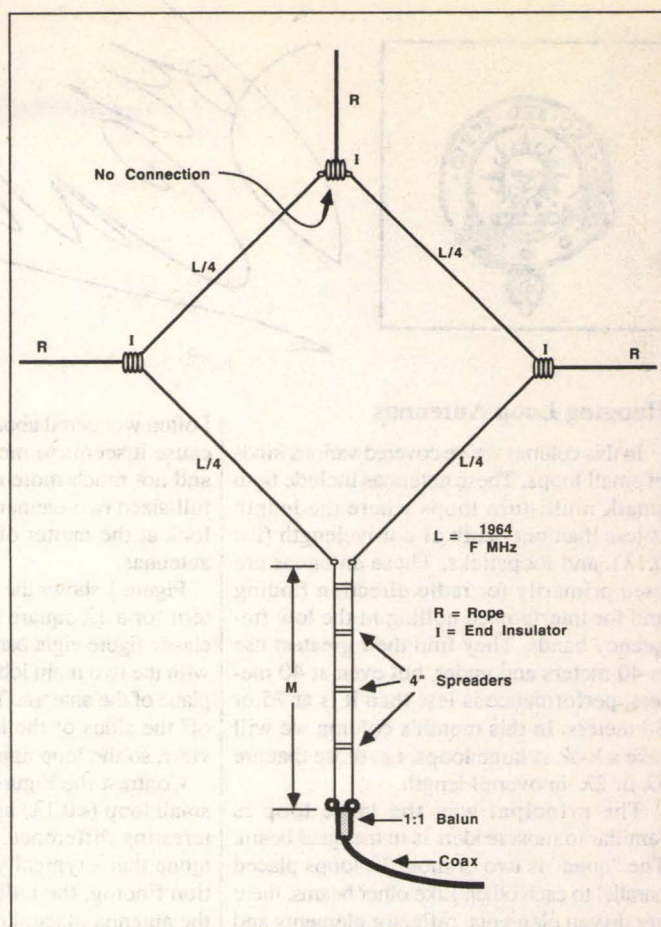


Figure 4. Bi-Square loop antenna.

The bi-square loop can be built in a manner similar to the quad loop, so we'll not repeat the same discussion. See ya next month. **RF**

HANDIE-BASE
Desktop Radio Stands
For Your Handheld Radio or Handheld Scanner. Features Include: Solid Wood Base, Powder Coated Steel Frame, Non-slip Rubber Feet. Models Available for Most Radios or Scanners. Works on Desktops, Tabletops, Work Benches, or any Flat Surface. Add An Extension Speaker/Mic, Power Supply & External Antenna and it Converts Your Handheld Radio Into A Base Station. To order send \$14.95 plus \$3.50 shipping to:

Handie-Base and More Inc.
P.O. Box 2504, Dept. D
Broken Arrow, OK 74013-2504
(Please specify the Model of Your Handheld Radio)
Satisfaction Guarantee

CIRCLE 182 ON READER SERVICE CARD

BATTERIES
Nickel-Cadmium, Alkaline, Lithium, Sealed Lead Acid For Radios, Computers, Etc. And All Portable Equipment
YOU NEED BATTERIES? WE'VE GOT BATTERIES!
CALL US FOR FREE CATALOG

E.H.YOST & CO.
7344 TETIVA RD.
SAUK CITY, WI 53583
(608) 643-3194
FAX 608-643-4439

CIRCLE 114 ON READER SERVICE CARD

SATELLITE T.V.
Factory Direct to Your Door
Echostar • Startrak • Houston Tracker • Orbitron
24 Hr. Pricing Hotline
516-763-6842

- Call for FREE Huge Color Catalog
- Domestic & International Systems
- Huge Savings!

Information & Orders 305-344-6000
ECHOTRAK™
4749 NW 98th Lane • Coral Springs, FL 33076

CIRCLE 157 ON READER SERVICE CARD

MORSE CODE MUSIC?
New-Powerful-Breakthrough, All 43 Morse Code characters sent with a rhythmic beat. A fun & easy way to learn or retain Morse Code skills. Now the secret is yours! order "THE RHYTHM OF THE CODE"™ Version II cassette today!

Send \$9.95 and we'll pay the shipping to:

KAWA PRODUCTIONS
P.O. Box 319-RF
Weymouth, MA 02188.

Check or money order only. We ship all orders within 10 days. Outside U.S.A. please add \$2. for air mail. MA residents please add 5% sales tax.

CIRCLE 2 ON READER SERVICE CARD

MacRadio™
Amateur Radio License Exam
Tutorials & Test Generators for
Macintosh Computers
New Question Pool
Technician & Novice Class
\$29.00 plus \$3.00 shipping
(CA add 8.25% tax)
Lightning Industries
1806 Milmont Dr., #125A, Milpitas CA 95035
Tel: (408) 942-7998 Fax: (408) 262-5441
Dealer Inquiries Invited

CIRCLE 335 ON READER SERVICE CARD

Great SWL Software!
NEW SWL Station Database
Contains thousands of radio station records. Records can be changed, updated or deleted. Sort by station, only \$19.95 frequency, time, language, \$25 outside country. Cont. U.S.
Specify IBM compatible 3.5 or 5.25 disks.

DXer-SWL Program Database
Schedules and frequencies of DX & SWL programs. Sort by station, only \$9.95 time or frequency Don't miss your favorite shows! \$12.95 outside Cont. U.S.

ORCHID CITY SOFTWARE
P.O. BOX 18402
WEST PALM BEACH, FL 33416

CIRCLE 73 ON READER SERVICE CARD

SPY ON THE EARTH
See live on your PC what satellites in orbit see

Learn how you can benefit greatly from this exciting new technology. Send \$39 check or M.O. (\$45 air, \$50 overseas) for our fantastic 12 diskette set of professional quality copyrighted programs (IBM type) that does satellite tracking, image acquisition, image processing, 3-D projections and more. Direct reception from the satellites guaranteed worldwide without a satellite dish. Schematics included for interface. For FREE information log-on to our bulletin board anytime at: (718) 740-3911.

VANGUARD Electronic Labs
Dept. RF, 196-23 Jamaica Ave.
Hollis, NY 11423 Tel.718-468-2720

QUICK, EASY, & COMPACT
Flash cards * NOVICE thru EXTRA * theory Key words underlined. Over 4000 sets in use! For beginner, OMs, XYLS & kids.

NOVICE	\$11.95
TECHNICIAN	\$10.95
GENERAL	\$ 9.95
ADVANCED	\$15.95
EXTRA	\$14.45
Shipping 1—	\$ 3.00
2 or more	—\$ 4.00
CLUB DISCOUNTS	

Order Today! from
VIS STUDY CARDS
P.O. BOX 16646
HATTIESBURG, MS 39404

CIRCLE 104 ON READER SERVICE CARD



upgrade . . . don't stop now

by Gordon West WB6NOA

HT Options

Dual-band handhelds are now the fastest selling amateur radio transceivers in the marketplace. Single-band hand-held transceivers are running a close second. For both newcomers and seasoned hams, nothing beats having an HT for local communications, scanning the public service nets above the ham bands, listening to the 24-hour weather service, and hearing all of the action both inside and outside the regular band limits.

When you go out looking to buy a new or used HT, there are a lot of options that you should consider. Some of these are "must have" options, while others are no big deal for most of us.

Battery and Charger

All new handhelds come with a wall charger and a rechargeable battery pack rated at approximately 600 milliamp hours. That's okay, but you need more. Always consider getting a rapid charger and a couple of additional battery packs. If you're on the air regularly, you'll need to use a couple of battery packs a day.

Personally, I like having an alkaline battery holder, too. This allows you to load your battery pack with a fresh set of alkalines, and have that pack always ready to run your handheld, even though the pack has been sitting in your glove box for the last two years. Alkaline cells normally don't self-discharge, but rechargeable cells do wind down after three months.

Encode/Decode

I wouldn't buy a handheld if it doesn't already have a built-in tone encoder. That's a must for many CTCSS open repeaters. The tone decode feature is nice, too, but not a necessity. If your unit has the tone decoder built in, it allows you to monitor a simplex frequency, and your unit stays quiet until someone else with the same tone calls you. It's a nice feature at a hamfest.

External Mike

You will need this if you plan to plug your handheld into your automobile's power and antenna systems. Check out the Yaesu FT-530—it has an illuminated speaker microphone that also contains a multi-function digital display! It's top of the line! However, a relatively inexpensive speaker/microphone will do well when you're running your rig off an external automobile antenna and power source.

CAUTION—DON'T RUN YOUR HANDHELD ON TRANSMIT ON YOUR BELT USING A SPEAKER MIKE. Why roast your gizzard any more than it already is with all this radio frequency stuff around you? Transmitting with an external mike with the unit on your belt dramatically cuts down on range, too.

Antennas

You can easily improve on that little rubber antenna that came with your new handheld. The shorter the little rubber duck, the less range you will enjoy. A telescopic whip is nice, but be careful not to jab anyone with it. Also, make sure the telescopic whip you use is lightweight so it doesn't over-stress the delicate BNC connection on the top of your handheld. Be very careful: If you smack your telescopic whip on an overhead obstruction you might not only break the whip, but also damage the inside circuit board on your handheld.

For mobile use, never ever run just the rubber duckie antenna inside the car. Your range is terrible, and it puts RF all over your body. Always use an outside antenna and enjoy a dramatic improvement in range.

External Power

Cautiously consider an external 12 volt source. Read over your instruction manual. If you plug your handheld into your cigarette lighter's 12 volt source for mobile use, running an outside antenna, it's probably going to get red hot on high power transmit. Don't



Photo B. The optional Standard chip simply plugs into the front of the rig for instant 200 channels.

get long-winded on high power with external 12 volt power unless your unit has some sort of circuit that bypasses the 12 volts over to your battery pack and charges the pack during long-winded transmissions. If, when you plug in 12 volts to the top or side of the handheld, it goes direct—watch out. Your set is going to get roasty-toasty after just a few minutes of high power TX.

Selective Calling

Of all the hams I know who have handhelds, I can't think of anyone who regularly uses the three-digit, four-digit or five-digit selective calling feature. It's a great idea, but systems differ from handheld to handheld. It really requires everyone to be part of the same system in order to make it really fly. And you know how hams can never agree on anything—it's no wonder that we don't have a standardized selective calling system that would allow us to selective call through a repeater in times of emergency. Some excellent repeater systems do have specific keypad numbers that wake up the control op in the middle of the night, but this is a lot simpler to access via the keypad than trying to go through your five-digit selective call sequence that is usually an optional board inside the radio. This one is your choice—but don't even think of trying to give WB6NOA a selective call because I ain't got one.

Memory Chip

Did you realize that most modern single-band and dual-band handhelds can accept a plug-in chip which will boost channel capacity up to 200 channels? That's right, the chips plug in, and you are off and running with a minimum of five times as many channels than originally came with the unit. Standard Radio Corporation will soon be preprogramming the optional channel chips for specific repeater coverage areas of the United States!

The Standard C-188 takes plug-in chips right on the outside of the unit, so you can change your frequency banks without a screwdriver. On other units, it's still a relatively simple job to open up the set, tweezer-out the 20/40 chip,

and push in the new 200-channel chip. But you do need to get into the unit. On the new Yaesu handhelds your PC computer could download the new channel information. And on the new Kenwood 78 handheld, you can clone this information from one radio to another.

So, when you are out shopping for handhelds, keep in mind those much-needed accessories that are available today. See which add-ons will make hand-held operation more enjoyable for you, and have fun! **RF**

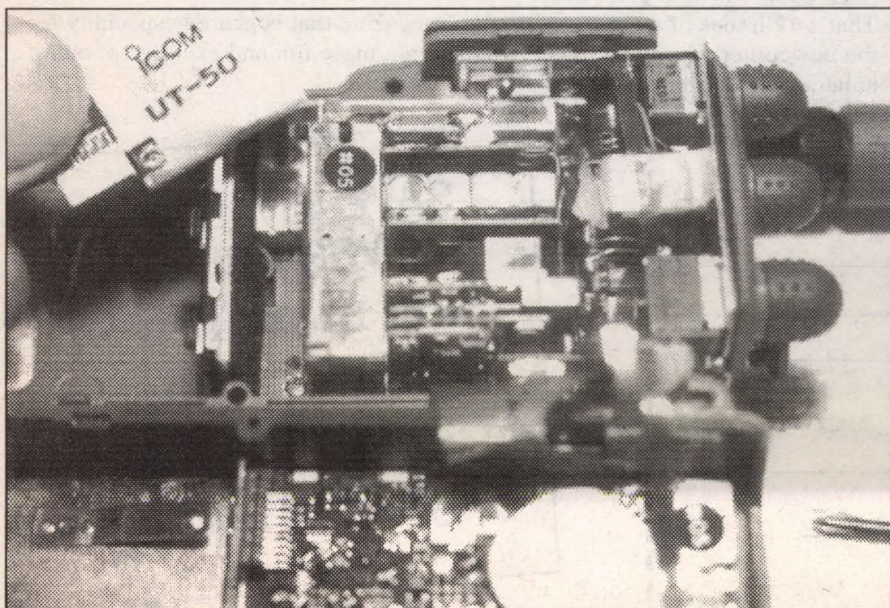


Photo A. The optional ICOM selective calling board plugs into the unit in minutes.

SCARED OF THE CODE?

IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops).

Available at dealers, thru QST or 73 or send \$29.95 + \$3 S&H (CA residents add 7.75% tax) to:

GGTE, P.O. Box 3405, Dept. MS,
Newport Beach, CA 92659
Specify 5¼ or 3½ inch disk
(price includes 1 year of free upgrades)

CIRCLE 193 ON READER SERVICE CARD

No other antenna matcher can do all that MAXCOM does.



- Get all-band HF coverage with a single dipole or long wire antenna.
- No tuning – ever! Just set it up, then forget it.
- No antenna tuner needed.
- Reduces a significant portion of atmospheric noise.
- Indestructible!
- Five Year Guarantee.

MAXCOM XLS
Single element ungrounded
vertical or longwire
configuration

Prices starting at \$299.
Call or write for information package.

MAXCOM



MAXCOM XLD
Standard two element
dipole or grounded
longwire configuration

P.O. Box 502
Fort Lauderdale, Florida 33302
Ph. 305-523-6369 • Fax 305-522-8159

CIRCLE 101 ON READER SERVICE CARD

ULTIMATE COMMUNICATIONS PROGRAM

specifically designed for

AEA's PK-88/232® and soon for the
PK900/DSP-1232/DSP-2232®

AMIGA® \$ 65.00
IBM® \$ 55.00
ATARI® \$ 52.00

- | | |
|-----------------|-----------------------|
| ✓ MENU DRIVEN | ✓ AUTO-CONNECT |
| ✓ PAKRATT | ✓ YAPP UP/DOWN LOAD |
| ✓ AMTOR | ✓ SCRAMBLE |
| ✓ BAUDOT | ✓ AUTO-CONNECT |
| ✓ ASCII | ✓ COLOR SELECTION |
| ✓ MORSE | ✓ ON SCREEN PARAMETER |
| ✓ FAX | ✓ ON SCREEN HELP |
| ✓ DUMB TERMINAL | ✓ USER NAME FILES |
| ✓ NAVREX | ✓ B TO A5 SEND |
| ✓ TDM | ✓ MUCH MORE |

EURO-AMI

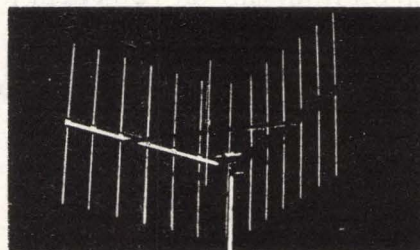
EXCLUSIVE IMPORTER
P.O. Box 990 MEREDITH, NH 03253

CIRCLE 83 ON READER SERVICE CARD

Say You Saw It In **Radio Fun**

CornerBeam?

SWR < 1.2:1 across the band
Gain of a 15 ft Yagi
No dimension over 7 ft
40 dB Front-to Back Ratio
60° Half-power Beamwidth
Mounts directly to mast
Vertical or Horizontal Polarization
2meters \$145, 220 MHz \$145, 70 cm \$115, Dual 146/440 \$165
Weights only 10 lbs. Add \$11 Shipping & Handling. Info \$1.



AntennasWest
Box 50062 Provo UT 84605

Order HotLine
801 373 8425

CIRCLE 380 ON READER SERVICE CARD

Townsend Electronics, Inc.

presents

C.M. Howes Kits

for

H.F. Amateur Equipment



"RIG SAVER"

H.T. and Mobil Mounts



THE WORLD'S BEST

in ham radio books and publications

28 page catalog \$1.00

Outside USA \$2.00

1-219-594-3661

Townsend Electronics, Inc.

Box 4155 • Pierceton, IN 46562

CIRCLE 299 ON READER SERVICE CARD

Radio Fun

The first and only magazine written especially for the newcomer to amateur radio.

Radio Fun is packed full of information to help you get more fun out of amateur radio. Basic "how-to" articles will get you up and running on packet, ATV, RTTY, DXing, and the dozens of other activities that make amateur radio such a great hobby. You'll get equipment reviews geared toward the newcomer, letting you know how to get the most out of your new or used gear. We'll help you upgrade to a higher class license with monthly columns designed to teach you what you need to know in a fun and exciting

way. We'll answer your questions on hundreds of things—how to check into a new repeater, how to build a QRP transmitter, how to get on the ham satellites, how to fix that broken rig, how a transistor works. You'll find it all, and more, in the pages of *Radio Fun*.

That's 12 issues of the only ham radio magazine that is geared especially for the newcomer, or any ham who wants to get more fun and excitement out of amateur radio—*Radio Fun*.

Radio Fun

70 Route 202, N • Peterborough, NH • 03458
(603) 924-0058 • Fax (603) 924-9327

☐ Yes! Send me _____ years of *Radio Fun* for \$12.97/year. Total enclosed = \$_____

NAME _____

ADDRESS _____

CITY _____

_____ Payment Enclosed _____ Charge my: _____ MC _____ VISA _____ AMEX

Card Number _____

Exp. Date _____

Class License _____ Year Licensed _____ 73 Subscriber _____

QST Subscriber _____ CQ Subscriber _____

_____ New Subscription _____ Please Extend My Present Subscription

Canada add \$7.00 plus .70 GST. Foreign add \$12.00 surface, \$36.00 airmail. Newsstand Rate \$24.97 Basic Subscription Rate \$12.97.

06R

**SAVE 46% OFF
COVER PRICE**
**Get more fun
out of radio
with *Radio Fun*.**
1 year—\$12.97



what's next?

by Carole Perry WB2MGP

Texas Hamcom '93

When it comes to having fun, no one does it better or more naturally than kids. Maybe that's one of the reasons I love putting together youth forums so much. It's a privilege to work with the many talented youngsters I've met from all parts of the country through their ham radio efforts.

At the Texas Hamcom in Arlington this year, I was positively impressed by the young speakers who assembled to share their radio experiences with a most receptive audience. The children were self-confident and spoke with the aplomb of seasoned lecturers.

Tim Tye KJ5IO, for example, is a wonderful 14-year-old ham radio operator who has acted as my net control for the CQ All Schools Net this past year. Tim is from Krum, Texas, where he participates in home study. At the youth forum, Tim spoke enthusiastically about the benefits of utilizing ham radio with children who are schooled at home. It has always been my pleasure to listen to Tim on the net and hear how well he conducts himself. It was an even greater pleasure for me to finally meet him in person.

The wonderful Texas weekend would not have been the same for me if I hadn't had the chance to meet with the Giesen family who drove up from Houston to participate in the forum. For the past two years, the Giesen sisters have added a charm and sweetness to our net every Tuesday and Thursday at 17:30 UTC on 28.303 MHz. Bad conditions on 10 meters have prevented us from hearing them recently. Marie KB5OPB is 14 years old, Shalon KB5OMY is 15, and Linda KB5PDW is 16. They've provided my ham radio classes with some terrific letter writing exchanges. The children at my school in Staten Island, New York,

eagerly look forward to the phosphorescent color QSL cards the girls send. Meeting with their parents and Uncle Bernie made it obvious to all of us what a huge difference a positive family influence can have in a young person's life. The girls are home schooled and will be going to Russia next year to study ethics and other subjects related to Bible teachings. It was a great personal treat for me to meet with them in person. I made them promise to stay in touch so my students and I can follow their exciting new adventure. We all wish them well.

Two other youngsters who really know how to WOW an audience are Casey KB5UEO and his brother Cody Haley KB5WYJ. At the tender ages of 8 and 10 respectively, these two charmers have already appeared at my Dayton Hamvention Youth Forum (this past April). Casey gets a lot of smiles from the audience as he tells us how he got right through a huge DX pile-up by announcing that he had to get to school in three minutes. "Sometimes, it pays to be a kid," says Casey. Both boys have very impressive contesting records, and more importantly, they really love working with their mom and dad, who are both hams and are obviously very proud of their sons.

Nathan Piatt KB5TDK is 15 years old and is a friend of Tim Tye's. Nathan is also home schooled and was a wonderful addition to our list of illustrious speakers. His sense of humor and easy manner won the audience right over. He, too, spoke of the value of ham radio for learning about people from all over the world. He told us how dependent on radio many of the overseas missionaries are. If these children I met in Texas are typical examples of home study students, there is certainly reason to respect this alternative to conventional schooling.

Ann Jacksa KB5YXM is a delightful 16-year-old who told us how she had never really paid serious attention to her dad's pleadings for her to get into ham radio. Then one day he volunteered to help her out with a science fair project. Ann had to admit that it turned out to be lots of fun. Now that she is a ham, she has found lots of fun things to do with the radio, like talking to friends and family on the repeaters and having such easy access to communications.

Another member of the distaff side was 12-year-old Rebecca Atchison KB5TVK, who spoke about how much fun she has on 6 meters. Rebecca and the other young ladies who appeared so ably at the Youth Forum add credence to my observation that in the last 13 years of teaching amateur radio to 10- to 14-year-olds, the girls have done equally as well as the boys. The necessary attributes to succeed appears to be simply self-determination and motivation.

Bryan Ward N5QGH is 14 years old. His dad was conducting one of the other forums at the convention. Bryan and his dad enjoy working on the microwave bands. That's what his dad's forum was about. Bryan is also active on 6 meters.

I'm always impressed by youngsters who are already licensed yet volunteer to help oth-



Photo A. Left to Right: Shalon KB5OMY, Carole WB2MGP, Linda KB5PDW, and Marie KB5OPB.

er kids get into the hobby. Anthony Berg KJ5GV is 16 years old, and spends lots of his free time helping others with CW. He holds an Extra Class ticket and enjoys lending his assistance to others. He is a friend of Tim's who welcomed the chance to encourage other children in the audience to join the rest of us for some real fun.

Kyle Britain KB5UBE is 12 years old and he, too, comes from an all-ham family. Kyle invited us all to see the BLT he brought for us. "Unfortunately, it's not a bacon, lettuce and tomato," said Kyle, "it's a brake light tester." We enjoyed watching Kyle demonstrate what he had built, and talk about how he enjoys ham radio construction projects.

I introduced Bradley Jacobs KB5JON who, at age 14, is Assistant Section Manager for the ARRL. He told the audience that it's his job to help out with recruiting of young people.

It's nice to see that the ARRL is starting to put youngsters into positions of responsibility like this.

One highlight of the two-hour forum came when we selected the winner of the Yaesu 2 meter HT FT-26 transceiver. It was won by Jerry KB5RGI, who is best friends with Cody Haly. Thanks go to Kevin at Yaesu for his continued support of our youth.

It was an honor for me to be part of this auspicious group. It's a benefit to all of us when adults come together to highlight the efforts of talented children.

Look for us on the CQ All Schools net this fall when school starts again, on our new alternate frequencies. Mondays and Tuesdays at 17:30 UTC (after the time change; 16:30 UTC) on 28.303 MHz for 10 minutes. If nothing is heard, please go to 21.325 for 10 minutes, and then to 14.325 MHz. CU then. **RF**

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

AUG 1

CROOKED LAKE, IN The annual Land of Lakes Angola Hamfest, sponsored by the Land of Lakes ARC, will be held at Steuben County 4-H Park from 6 AM-1 PM. Talk-in on 147.180; packet: 145.090; 444.358-131.8 tone; 224.94 and 53.050 Angola Rptrs. Contact Sharon Brown WD9DSP, 905 W. Parkway Dr., Pleasant Lake IN 46779. Tel. (219) 475-5897.

AUG 8

MINERAL WELLS, WV The Mid-Ohio Valley ARC will hold their 5th annual Hamfest at the 4-H Campgrounds from 7 AM-4 PM. Talk-in on 146.745/145 and 443.050/550. Contact Ron Ferrell WD8RGZ, (614) 423-5482, or Bill McClure WF8U, (304) 485-7777.

PEOTONE, IL The 59th annual Hamfest/Computer Festival, sponsored by the Hamfesters RC, Inc. of Chicago, will be held from 8 AM-3 PM DST at the Will County Fairgrounds. Talk-in FM STARS and KARS Rptrs. will be used: STARS 146.64, KARS 146.94, and 146.52 simplex. Club call is W9AA. Contact David F. Brasel NF9N, Hamfesters Radio Club, 7528 W. 109th Pl., Worth IL 60482. Tel. (708) 448-9432.

WHITE PLAINS, NY The Westchester County Center will be the site for the American Radio Relay League—Eastern New York Section Convention. Sponsor: Westchester Emergency Communications Assn. Vendor spaces must be reserved in advance. Contact WECAFEST '93, Jeanne Raffaeli N2NQY, 544 Manhattan Ave., Thornwood NY 10594. Tel. (914) 962-9666.

AUG 13-15

VERNON, CT The 19th Annual Eastern VHF/UHF/SHF Conference will be held at the Quality Inn (on the Hartford Turnpike). To get a registration form, write (with SASE) to: Byron Blanchard N1EKV, 16 Round Hill Rd., Lexington MA 02173. For room reservations, contact Lori Tozier, (203) 646-5700. Special rate available.

AUG 14

BURLINGTON, VT The Burlington ARC will hold their BARC 41st Int'l. Hamfest at the Old Lantern Campground, Greenbush Rd., Charlotte VT. For camping info, call (802) 425-2120. Talk-in on 146.61/01, 146.94/34, 146.52 simplex. ARRL VEC Exams. For general info, call David Berteau, (802) 893-7660.

RHINELANDER, WI The Northwoods ARC, the Rhinelander/Tomahawk Rptr. Assn., and the ARRES, will co-sponsor a Swapfest at the Sugarcamp Town Hall (12 miles north of Rhinelander on Hwy. 17), from 8 AM-3 PM. VE Exams at 9 AM; registration at 8:30 AM. Talk-in on 146.94 Rhinelander Rptr.; also, 145.43 Tomahawk Rptr. For table info, write to Glenn Woods N9GRF, 6569 Hillcrest Dr., Rhinelander WI 54501.

AUG 14-15

HUNTSVILLE, AL The 1993 Huntsville Hamfest/ARRL Nat'l. Convention, will be hosted by Huntsville Hamfest, Inc. at the Von Braun Civic Center, beginning at 9 AM both days. Talk-in by K4BFT will be on 146.34/94. Contact Huntsville Hamfest, P.O. Box 12534, Huntsville AL 35815. Tel. (205) 534-7175.

AUG 15

CAMBRIDGE, MA The MIT Electronics Research Soc., the MIT Radio Soc., and the Harvard Wireless Club will hold a Flea Market from 9 AM-2 PM at Albany and Main St. Talk-in on 146.52, and 449.725/444.725 - pl 2A - W1XM/R. Get details by calling (617) 253-3776.

EASTON, PA The Delaware-Lehigh ARC, Inc. Computer/Hamfest will be held at the Career Inst. of Tech. beginning at 8 AM. VE Exams. Talk-in on 146.70 W3OK Rptr. Contact Bill Goodman K3ANS, (215) 253-2745 or (215) 258-5063. Also call the DLARC Answering Service, (215) 820-9110.

QUINCY, IL The Western Ill. ARC will hold their Swapfest from 8 AM-2 PM at the Eagles Alps Lodge, 3737 N. 5th St. 1 mi N of US 24 and N 5th St. intersection. VE Exams. ARRL table. Talk-in on 147.63/03, and 146.34/94. Contact Rod Simon N9MCX, c/o WIARC, P.O. Box 3132, Quincy IL 62305.

AUG 21

ITHACA, NY The Finger Lakes Hamfest will be held at the Armory Bldg., Rt. 13 and Hanshaw Rd. The Tompkins County ARC will host this event from 7 AM-3 PM. VE Exams - No walk-ins - Register by Aug. 3rd. Talk-in on 146.37/97. Contact Ross NZISU, c/o T.C.A.R.C., P.O. Box 4144, Ithaca NY 14852-4144. Tel. (607) 257-3511.

AUG 22

MARYSVILLE, OH The Union County ARC will sponsor their 17th annual Marysville Hamfest/Computer Show at the Fairground

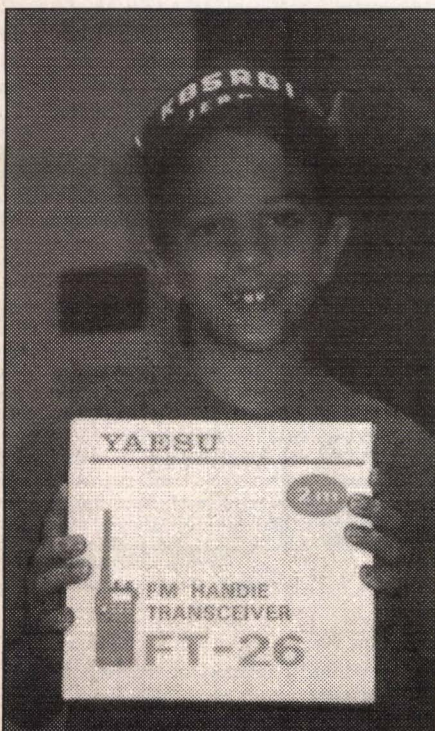


Photo B. Jerry KB5RGI shows off his new treasure.

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The **Radio Fun Flea Market** costs you peanuts (almost)—comes to 25 cents a word for individual (noncommercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and julybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to **Radio Fun Flea Market**, Judy Walker, 70 Route 202 N, Peterborough NH 03458, and get set for the phone calls.

The Deadline for the September 1993 Flea Market is July 21, 1993.

CUSHCRAFT BOOMER 124 WB 2 Meter Yagi, like new. \$40.00 FOB Peterborough. KD1NY John M. C. Wilson, RR #2 Box 368, Peterborough, NH 03458 RF230

SENSATIONAL NEW WAY TO LEARN CODE-Do Aerobics, Sing, Jog, or Drive while learning code! Now the secret is yours! Order **THE RHYTHM OF THE CODE-Morse** code music cassette today! \$9.95 ppd **KAWA RECORDS**, P.O. Box 319-R, Weymouth MA 02188. The **HIT** of the 1993 Dayton Hamvention! RF247

MINIATURE POLICE RADAR TRANSMITTER one mile range, \$41 assembled, \$31 kit, (219)489-1711. P.O. Box 80096, Fort Wayne IN 46898. RF251

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD Software \$4.00 disk. Two-stamp SASE brings catalog. Specify computer! **KINETIC DESIGNS HAMWARE** Box 1646, Orange Park FL 32067-1646. RF266

HOME BREW COMPONENTS. Large SASE brings catalog. **KA7QJY COMPONENTS**, Box 3893, Logan UT 84323. RF271

MOTOROLA WALKIE ON MARINE FRE-QU. drop in charger and new battery, \$150.00 or SWAP for 6 or 2 meter rig. Mike Starr, N8OVJ. (313)797-4150 Nights. RF405

BROWNIES QSL CARDS since 1939. Catalog and Samples \$1 (refundable with order). 3035 Lehigh Street, Allentown PA 18103. RF475

WANTED: SCHEMATIC Siltronix model 1011-C, copy ok, reasonable fee. (704)333-9363 ET. RF495

PASS THE NO CODE TEST. "Easy Method." Send \$4 and SASE to **L.W. SERVICE**, P.O. Box 91, Hillside NJ 07205-2702. RF500

RCI-2950 OWNERS: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only \$20.00 ppd in U.S. (Missouri residents add \$1.15 tax). **SCOTT**, PO Box 510408, St. Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. RF515

INEXPENSIVE HAM EQUIPMENT. Send stamp for list. WA4DSO, 3037 Audrey Drive, Gastonia NC 28054. RF559

PRINTED CIRCUIT BOARDS for 73 Magazine projects. Drilled, plated, G10. Techno Whizzy-1 VFO, \$7.50; Matrix, \$8.00; Amp, \$5.50. Also boards for *QST*, *HamRadio*, *Nuts & Volts*, *Electronics Now*, *ETI Magazine*, *ARRL Handbooks*. Full list free. U.S. orders DEDUCT 20%. **B-C-D ELECTRONICS**, Box 20304, 858 Upper James Street, Hamilton Ontario, Canada L9C-7M5. RF585

LICENSE PLATE HOLDERS (Chrome or Black) with message plates. Your name and call letters engraved. Designed mail box plate 12 1/2" X 4 1/4" black. Name and Number engraved. Chrome or black license plate holder, \$10.50; mail box plate, \$12.50. Each order S&H, \$2.50. **N.E. MARION ENGRAVING**, R.F.D. 2, Box 360, Peterborough NH 03458. RF590

PRINTED CIRCUIT BOARDS for projects in 73, *Ham Radio*, *QST*, *ARRL Handbook*. List, SASE. **FAR CIRCUITS**, 18N640 Field Ct., Dundee IL 60118. RF595

WANTED: BUY & SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0929. **C & N ELECTRONICS**, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. RF620

OFFERED PEANUTS For Your Trade-In Rig? I pay cash! **RADIO RECYCLERS**, 7730 W. National Ave., West Allis WI 53214. (414)771-7121. RF625

WANT A SUPERIOR KEY? Hi-Mounds paddle, handkeys, bug, thigh strapped mobilekey, have smooth responsive handling. Eye-catching quality, appearance, eliminate fist fatigue! SASE information. **K8XF**, 9929 Foxsquirrel Dr., Newport Richey FL 34654-3517. RF635

FINALLY AVAILABLE! A rugged, reliable, reasonably priced handheld carrying case, \$18.95. Lifetime Warranty. **THE CASE** (800)276-6179. RF670

SWAN ASTRO 102BX, 160-10 Meter, power supply, antenna tuner, Heathkit electronic keyer; Misc. Ham publications including *Radio Fun*, *QST*, and 73 1980-Present, some complete. Great beginner package. \$350 takes all. (216)587-1308 after 2 pm ET. RF695

RADIO TRANSCRIPTION DISCS WANTED. W7F1Z, Box 724, Redmond, WA 98073-0274. RF700

FREE Ham Gospel Tracts. SASE. **N3FTT**, 5133 Gramercy, Clifton Heights PA 19018. RF960

CONNECTICUT'S favorite ham store. **ROGUS ELECTRONICS**, 250 Meriden-Waterbury Turnpike, Southington CT 06489. (203)621-2252. RF994

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! **CRB RESEARCH**, Box 56-RF, Commack NY 11725. RF996

AMATEUR RADIO REPAIR!! All makes & models, average labor per unit, \$96.00. **W7HBF, DAN RUPE**, 1302 S. Up-land Dr., Camano WA 98292. (206)387-3558. RF999

in Marysville OH (near Columbus). VE Exams on a walk-in basis only. Contact **Don Sabins N8MGJ**, 15704 Jolly Rd., Marysville OH 43040. Tel. (513) 642-0475.

ST CHARLES, MO The St. Charles ARC will host Hamfest93 at the Blanchette Park, 6:30 AM-2:30 PM. Vendor area open 9 AM. Talk-in on 146.071/67. Contact **Scott Schultz N0UVM**, 241 Burning Leaf Dr., St. Peters MO 63376. Tel. (314) 928-7267. VE Exam pre-registration: (314) 524-3254.

TOWSON, MD The 3rd annual Moose ARC Ham and Computerfest will be held 8 AM-4 PM at the Loyal Order of Moose, Towson Lodge 562. Talk-in on 145.330 and 224.12. Advance registration and info, **Nick Nickles WZ3J**, (410) 668-2363, or write: *Loyal Order of Moose, Towson Lodge 562, MOOSEFEST, 8801 Mylander Ln., Towson MD 21286.*

AUG 22-23

ALBUQUERQUE, NM The New Mexico Army Nat'l. Guard Armory, 600 Wyoming Blvd. N.E., will be the location for the Duke City Hamfest/ARRL Section Convention. Sponsors: The Duke City Hamfest and associated Clubs. Talk-in on 147.10 MHz Rptr. (+600 kHz), Rio Rancho K8BL. SASE to: *The Duke City Hamfest, P.O. Box 6552, Albuquerque NM 87197-6552.*

AUG 28

CHAFFEE, NY The PROS (Pioneer Radio Op. Soc.) will sponsor a Hamfest from 6 AM-5 PM at Manion Pk. Talk-in on 145.390 and 444.175. Contact **Paul Sumski KA2ZMC**, P.O. Box 334, Arcadia NY 14009. Tel. (716) 492-3198.

FREDRICKSBURG, VA Call **AC4SK** at (703) 373-7076; or **AC4MB** at (703) 891-5581, for details about VE Exams to be conducted at the Central Rappahannock Library.

GAINESVILLE, TX The Cooke County ARC, Inc. will host its 2nd annual Ham Fest at the Civic Center beginning at 9 AM Sat. morning. Set-up Fri. Aug. 27th from 4 PM-9 PM and Sat. Aug. 28th from 8 AM-9 AM. VE Exams, all classes.

GARDNER, MA The 1st annual Flea Market to be sponsored by the Mohawk ARC, will be held rain or shine at Mohawk Drive-In Theater. Talk-in on 145.370 -600. Contact **Bill WJ1Y** at (508) 939-2643. Doors open at 0800 hrs.

MANVILLE, NJ The Somerset County ARS will hold its annual Hamfest at the Manville Civil Defense Bldg. at 60 Weiss St., starting at 8 AM. Talk-in on 448.175 (-5), 224.88 (-1.6), 146.53 simplex. Call **Ron Walkowiak N2RPK**, (908) 685-1191, 6 PM-9 PM; or **Pete Sepesi WA2OCN**, (908) 722-2890, 6 PM-9 PM.

ROSEAU, MN A Hamfest will be held by the Woods Rptr. Assn., at the Roseau High School Gym, Hwy. #11 E., beginning at 10 AM. VE Exams. Talk-in on 147.691/09 and 146.40/147.00. Reserve before Aug. 20th. Contact **David Landby K8OHP**, Rte. 3 Box 10, Warroad MN 56763. Tel. (218) 386-1092.

AUG 29

LEBANON, TN The Short Mountain Rptr. Club will hold a Hamfest at Cedars of Lebanon State Pk., U.S. Hwy. 231, 7 miles S of I-40. Time: 7 AM-3 PM. Talk-in on 146.91. Contact **Mary Alice Fanning KA4GSB**, 4936 Danby Dr., Nashville TN 37211. Tel. (615) 832-3215.

YONKERS, NY Yonkers Municipal Parking Garage, on Main St., will be the location for the Hamfest/Computerfest being held by The Yonkers ARC, from 9 AM-3 PM. Talk-in on 146.865/R, 440.150/R, and 146.52 simplex. Get the details from **John WB2AUL**, (914) 963-1021; or **Jim N2ONM**, (914) 969-5182.

SEP 3-4

ALAMOGORDO, NM The Alamogordo ARC will hold its 9th annual Hamfest on Fri., Sep. 3rd, from 3 PM-9 PM; and Sat., Sep. 4th from 8 AM-2 PM. VE Exams will be held on Sat. at 9 AM for all classes; call **Ole Jorgensen WASIPS**, (505) 437-5896. For Hamfest info, contact **Bill Leehan N5SUM**, (505) 437-9781.

SEP 19

RAWHIDE, AZ Thirteen local Amateur radio clubs of Phoenix AZ will sponsor a Family Amateur Radio Event beginning at 10 AM at a Pavilion in Rawhide. Loads of events. Talk-in on 146.76. For details, write to: **FARE**, P.O. Box 9219, Phoenix AZ 85068.

SPECIAL EVENT STATIONS

JUL 29-AUG 1

OSHKOSH, WI Members of the Fox Cities ARC will operate W9ZL 8 AM-5 PM daily, from the Experimental Aircraft Assn. Fly-In and Convention (at the "Pioneer Airport" adjacent to the EAA Aviation Museum). Operation will be on the General phone portions of the HF bands, as well as RTTY and CW, as conditions permit. The Club will also be giving "on grounds" convention info on 146.520 simplex. To get a 8 x 10 certificate, send proper QSL and SASE only to **Wayne Pennings WD9FLJ**, 913 N. Mason, Appleton WI 54914.

AUG 1

SKOKIE, IL Members of the Orchard Village RC will operate N9HEL from 1600-2300 hrs., in the lower 25 kHz of the General 20, 15 and Novice 10 meter SSB subbands (depending on band conditions). Orchard Village is a residence for the developmentally disabled, and this station will give their radio club members (all studying for Novice class licenses) an opportunity to practice their skills, as well as demonstrate amateur radio to other residents and guests. For a QSL, send your QSL and SASE to **Gloria Beverly**, c/o Orchard Village, 7670 Marmora, Skokie IL 60076.

AUG 7-8

LANNON, WI Special Event Station W9WK, will be operated by the Milwaukee A.R.E.S., 0200Z Aug. 7-2000Z Aug. 8, to celebrate the 3rd annual "Picnic Ham" held at Menomonee Pk. Operation will be in the General phone and CW bands on 75, 40, 20, 15 and 10 meters. For a certificate, send QSL and a 9 x 12 envelope (with 2 units of postage) to **W9WK**, c/o **John Leekly**, 757 N. Broadway, Suite 306, Milwaukee WI 53202.

MT. DAVIS, PA The Somerset County ARC will operate NJ3T from the highest point in Pennsylvania. Operation will be on the lower 50 kHz of the General class phone bands, on 10-80 meters as conditions allow. For a certificate, send QSL and SASE to **Jim Crowley NJ3T**, R.D. 5 Box 223A, Somerset PA 15501.

AUG 13-SEP 6

ISLINGTON, ONT., CANADA Station VE3CNE, Toronto, will operate 1400Z-0200Z, in conjunction with the Canadian Nat'l. Exhibition. Frequencies: Even hours: 14.015 MHz, CW and SSB; 14.150 MHz SSB listening; Odd hours: 7.020 MHz, CW and SSB; 7.075, SSB listening. For details and QSL response, mail to **VE3CNE**, P.O. Box 307 Stn. H, Toronto, Canada M4C 5J2.

AUG 14

MIAMISBURG, OH Members of the Mound ARA will operate W8DYY 1200Z-2200Z; the phone portion and Novice 10 meters, General portion of 20 and 40 meters, to celebrate the 175th Anniversary of Miamisburg. For QSL card, send SASE to **MARA**, c/o **Jeem Newland WB8RXI**, 240 Carlwood Dr., Miamisburg OH 45342.

AUG 14-16

BENNINGTON, VT The Southern VT ARC will operate NJ1JF 1400Z-0500Z, to commemorate the Battle of Bennington and the 3rd Anniversary of SOVARC. Operation will be in the 80-15 meter General phone subbands and the Novice 10 meter phone subband. For parchment certificate, send QSL card, contact no., and a 9 x 12 SASE to **Micky Corrow NJ1JF**, RR2 Box 48, Bennington VT 05201-9537.

AUG 14-18

ST. PAUL ISLAND, NOVA SCOTIA Members of the West Island ARC of Montreal are planning an expedition to St. Paul Island, and plan to operate Station CY9CWI in CW, SSB, and RTTY. Operations begin at 0000Z Aug. 14 and will continue through Aug. 18. Times are tentative. Frequencies: CW (MHz) 1.835, 3.505, 7.040, 10.120, 14.035, 18.105, 21.040, 21.120, 28.050; SSB (MHz) 1.840, 3.780, 7.205, 14.195, 18.130, 21.295, 24.490, 28.395; RTTY (MHz) 3.590, 7.040, 14.090, 21.090, 28.090. Address QSLs to the West Island ARC, Inc., P.O. Box 884, Pointe-Claire/Dorval, QC H9R 4Z6, Canada. Address inquiries to **Fred Archibald VE2SEI**, 130 Embleton Crescent, Pointe Claire QC H9R 3N2 Canada.

AUG 14-22

KNOX, PA Knox-area hams will operate KE3CN, N3IOP, W3MBD, and KA3WJ, to commemorate the annual "Horse Thief Days Festival." Operation will be in the 40, 20, 17, and 15 meter bands, and 28.350 Novice. For a certificate, send QSL and SASE to **Gloria Barlett N3IOP**, Box 12, Knox PA 16232.

AUG 18-25

CALGARY, ALBERTA, CANADA The Calgary ARA will operate Station CH8MNP from Cameron Island (100 Kms from Magnetic North Pole) on 160-6 meters, all bands. Frequencies: 28460, 28560, 14260, 21260, 7060, 3760; CW, 5 up from bottom edge of bands. QSL to **CARA**, Box 592 Stn. M, Calgary Alberta T2E 5J6, Canada. Please include IRC, Canada postage stamps or equivalent.

AUG 20-22

SOCORRO, NM The National Radio Astronomy Observatory ARC will operate Station NA5N for the dedication of NRAO's Very Long Baseline Array (VLBA), a continent-wide system of radio telescopes that will be the world's largest dedicated astronomical instrument. NA5N will operate from 1800Z Aug. 20-0200Z Aug. 21; and from 1800Z Aug. 21-0200Z Aug. 22, on 80, 40, 20, 15 or 10 meters, depending on propagation, in the lower portions of the General-class phone and CW segments. A special net including amateurs from the VLBA antenna sites and other NRAO observatories will be held at 1800Z Aug. 21st on 14.250 MHz. For QSL, send QSL and SASE to **NRAO ARC**, P.O. Box O, Socorro NM 87801.

AUG 21

FRANKFORT, NY Members of the Fort Herkimer ARC will operate AA2AT 1200Z-1800Z at the fairgrounds, in conjunction with the Herkimer County Fair. Operation will be on 10 meters Novice phone, lower portion of 15 meters Novice CW, and the lower portion of 15 and 20 meters General phone, per band conditions. For a certificate, send QSL and SASE to **FHARC**, c/o **Madeline M. Loiacano AA2AT**, 342 Fourth Ave., Frankfort NY 13340.

AUG 21-22

SAN RAFAEL, CA The Marin ARC, Inc. will operate W6SG 1000-1600 hrs. (PDT), from the clubhouse locations at Hamilton AFB and the San Rafael Red Cross, to commemorate the 60th Anniversary of the club. Operation will be on all bands, all modes, including the Novice subbands. Look for W6SG at the lower portion of each subband. For a certificate, send QSL and SASE to **MARC**, P.O. Box 151231, San Rafael CA 94915-1231.

VANCOUVER, WA Station W7AIA will be operated by the Clark County ARC to help the Northwest Antique Aircraft Club to celebrate the 34th annual Fly-In at Evergreen flying field, just East of Vancouver. Operation will be in the lower portion of the General phone bands; 40, 20, 15, with possible operation in the 10 meter novice band, and 75 meter band at night. For a certificate, SASE to **CCARC**, P.O. Box 1424, Vancouver WA 98668.

AUG 21-23

ENGLEWOOD, NJ The Englewood ARA, Inc. invites all amateurs the world over to take part in the 34th Annual New Jersey QSO Party. The contest is from 2000 UTC Aug. 21-0700 UTC Aug. 22; and from 1300 UTC Aug. 22-0200 UTC Aug. 23. Get details from **Englewood ARA, Inc.**, P.O. Box 528, Englewood NJ 07631-0528. RF

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

02D42 **Digital Novice** by Jim Grubbs Geared to make you a more knowledgeable participant. \$8.50

01A87 **Shortwave Listener's Antenna Handbook** Primer antenna theory. \$13.95

05C25 **Basic A.C. Circuits** A step-by-step approach for the beginning student. \$24.50

20N018 **Technician Class License Manual: New No-Code** by Gordon West This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. \$9.95

20N092 **The Wonderful World of Ham Radio** by Richard Skolnik, KB4LCS Simple, clear, and fun. Introduces young people to amateur radio. \$7.95

20N100 **Electronics Build and Learn (2nd Ed.)** by RA Penfold Combines theory and practice so that you can "learn by doing." \$12.50

20N099 **Digital Electronics Projects for Beginners** by Owen Bishop Contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. \$12.50

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. \$9.50

AR2871 **W1FB's Help for New Hams** by Doug DeMaw W1FB Complete for the newcomer. Put together a station and get on the air. \$10.00

AR2286 **First Steps in Radio** by Doug DeMaw W1FB Series of QST articles. \$5.00

SHORTWAVE

06S57 **1993 Passport to World Band Radio** by International Broadcasting Services. Lld You'll get the latest station and time grids. \$16.50

03S11 **Shortwave Receivers Past and Present** edited by Fred J. Osterman Guide to 200+ shortwave receivers manufactured in the last 20 years. The Blue Book of shortwave radio value. \$8.95

07R25 **The RTTY Listener** by Fred Osterman New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. Contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. \$19.95

03C09 **Shortwave Clandestine Confidential** by Gerry L. Dexter Covers all clandestine broadcasting, country-by-country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. \$8.50

03M221 **US Military Communications (Part 1)** US Military communication channels on shortwave. Covers frequencies, background on point-to-point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. \$12.95

03M222 **US Military Communications (Part2)** Covers US Coast Guard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. \$12.95

03M223 **US Military Communications (Part 3)** Completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. \$12.95

09S42 **The Scanner Listener's Handbook** by Edward Soomre N2BFF Get the most out of your scanner radio. \$14.95

11T88 **Tune in on Telephone Calls** by Tom Kneitel K2AES Formatted as a frequency list with detailed description of each service and its location in RF spectrum. \$12.95

03K205 **Guide to Radioteletype (RTTY) Stations** by J. Klingenfuss Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteor, PTTs, embassies, and more. \$12.95

11AS10 **Air Scan Guide to Aeronautical Communications (5th Ed.)** by Tom Kneitel K2AES Most comprehensive guide to monitoring US aeronautical communications. Covers all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. \$14.95

15A002 **Scanner and Shortwave Answer Book** by Bob Grove Most frequently asked questions by hobbyists. \$13.95

07A66 **Aeronautical Communications Handbook** by Robert E. Evans Exhaustive, scholarly treatment of shortwave aeronautical listening. \$19.95

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** by Tom Kneitel K2AES This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. \$19.95

11F52 **Ferrell's Confidential Frequency List, New Revised Edition** compiled by A.G. Halliway All frequencies from 4 MHz-28MHz covering ship, embassy, aero, Volmet, Interpol, numbers, Air Force One/Two, more. \$19.50

11SR97 **National Directory of Survival Radio Frequencies** by Tom Kneitel K2AES Handy and concise reference guide to high interest communications frequencies required by survivalists. \$8.95

11SM11 **Scanner Modification Handbook, Vol. 1** by Bill Creek provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. \$17.95

11EE06 **Guide to Embassy Espionage Communications** by Tom Kneitel K2AES Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. \$10.95

15D93 **1993 Shortwave Directory (8th Ed.)** by Bob Grove Extensively revised, the new 1993 Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum, up-to-date and accurate. \$21.95

20N094 **A Flick of the Switch, 1930-1950** by Morgan E. McMahon Discover the fast-growing hobby of radio collecting. \$8.95

07R26 **World Wide Aeronautical Communications** by Robert E. Evans Aircraft/Air Traffic Control, Aircraft/Company Operations, Aviation Weather Broadcasts, Aeronautical Flight Tests, Worldwide Military Air Forces, Aero Search & Rescue, Aero Law Enforcement, NASA Flight Support, Aero Terms & Abbreviations and Aero Tactical Identifiers. \$6.95

11T89 **Scanner Modification Handbook Vol. 2** by Bill Creek Here it is—a companion to Vol. 1. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. \$17.95

03R01 **World Press Services Frequencies (RTTY) New 5th Ed.** A comprehensive manual covering radioteletype news monitoring—contains all information—antenna, receiving, terminal units, plus three extensive frequency lists. \$8.95

ARRL BOOKS

AR1993 **ARRL 1993 Handbook (70th Ed.)** 39 chapters, featuring 2,100 tables, figures and charts. Comprehensive, well organized and affordable. \$25.00

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers. OSCAR, VHF-UHF. \$18.00

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. \$10.00

AR2545 **Antenna Compendium Vol. 2** Covers verticals, yagis, quads, multiband and broadband systems, antenna selection. \$12.00

AR4017 **Antenna Compendium Vol. 3** More verticals, yagis, quads, plus loops, arrays, mobile, direction finding, controlled currents, computerized, installation, overloads, plus 40 new articles for beginner's to advanced. \$14.00

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. \$10.00

AR0488 **W1FB's Antenna Notebook** by Doug DeMaw W1FB Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. \$9.50

AR0348 **QRP Notebook** by Doug DeMaw W1FB Presents construction projects for the QRP operator. \$9.50

AR4141 **W1FB's Design Notebook** by Doug DeMaw W1FB Filled with simple practical projects that can be built using readily available components and common hand tools. \$10.00

AR2200 **Antenna Impedance Matching** by Wilfred N. Caron Most comprehensive book written on using Smith Charts in solving impedance matching problems. \$15.00

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. \$12.00

AR3193 **Weather Satellite Handbook (4th Ed.)** by Dr. Ralph Taggart W8BDOT Expanded and revised to reflect today's weather-fax satellite technology. \$20.00

AR3290 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. \$10.00

AR3291 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technician and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. \$19.00

AR3292 **Your Introduction to Morse Code: Practice Cassettes** Kit includes two 90 minute cassette tapes. Prepares you for the 5 WPM Morse code exam to earn your Novice license or add high-frequency world-wide communications privileges to your code-free Technician license. \$10.00

AR0437 **ARRL Repeater Directory 1993-1994** 19,000+ listings with digipeaters, bandplans, CTCSS (PL/TM) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24GHz. \$6.00

AR1033 **The DXCC Companion** by Jim Kearman KR1S Spells out in simple, straightforward terms what you need to be a successful DXer. \$6.00

AR1250 **Log Book—Spiral** \$3.50

ARA341 **Interference Handbook** RFI sleuth's experience in solving interference problems. \$12.00

AR2197 **ARRL Data Book** Valuable aid to the RF design engineer, technician, radio amateur, and experimenter. \$12.00

AR2960 **Transmission Line Transformers (2nd Ed.)** by Dr. Jerry Sevick W2FMI Practical designs and specific information on construction techniques and sources of material. \$20.00

AR0410 **Yagi Antenna Design** A Ham Radio series polished and expanded by Dr. Lawson. \$15.00

AR2171 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. \$8.00

AR3169 **QRP Classics** Compilation of ARRL publications on building receivers, transmitters, transceivers, accessories. \$12.00

ARRL License Manuals Complete FCC question pools with answers.

AR2375	Technician Class	\$6.00
AR2383	General Class	\$6.00
AR0166	Advanced Class	\$6.00
AR2391	Extra Class	\$8.00

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** by Martin Davidoff K2UBC Expanded and revised. Focusing on satellites built by and for the international radio amateur community. \$20.00

AR2456 **FCC Rule Book (9th Ed.)** A must for every active radio amateur. \$9.00

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode. \$12.00

AR2103 **Satellite Anthology** The latest information on OSCARS 9 through 13 as well as the RS satellites, the use of digital modes, tracking antennas, RUADAK, microcomputer, and more! \$5.00

AR2898 **Space Almanac** by Anthony R. Curtis K3KXX Recent news from space. \$20.00

AR2083 **Complete DX'er (2nd Ed.)** by Bob Locker W9KNI Learn how to hunt DX and obtain hard-to-get QSL cards. \$12.00

AR2065 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. \$20.00

AR3293 **Morse Code: The Essential Language** by L. Peter Carron Jr. W3DKP Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. \$6.00

STUDY AIDS

VIS Study Cards Compact, up-to-date Flash Cards with Key Words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	\$11.95
TECH	VIS02	10.95
GENERAL	VIS03	9.95
ADVANCED	VIS04	15.95
EXTRA	VIS05	14.45

REFERENCE

20N102 **Practical Digital Electronics Handbook** by Mike Tooley BA Contains nine digital test gear projects. Digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices. \$14.50

20N103 **Electronic Power Supply Handbook** by Ian R. Sinclair Covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. \$16.25

20N104 **Electronic Test Equipment Handbook** by Steve Money A guide to electronic test equipment for the engineer, technician, student and home enthusiast. \$18.00

20N105 **Digital Logic Gates and Flip-Flops** by Ian R. Sinclair A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly and from the beginning. \$18.00

01C80 **Master Handbook of 1001 Practical Electronic Circuits** Tried and proven solid state circuits. \$19.95

01P68 **Pirate Radio Stations** by Andrew Yody Tuning in to underground broadcasts. \$12.95

01T01 **Transmitter Hunting** by Joseph Moell and Thomas Curlee Radio direction finding simplified. \$19.95

03R02 **Rtty Today** by Dave Ingram Modern guide to amateur radio-teletype. \$8.50

05E03 **First Book of Modern Electronics** Unique projects that are money saving. \$12.95

09D22 **The World Ham Net Directory** by Mike Witkowski New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. \$9.50

09P33 **Pirate Radio Directory** by George Zeller Where to tune in on secret entertainment stations. \$7.95

10F093 **1993 International Callbook** The new 1993 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). \$29.95

10D093 **1993 North American Callbook** The 1993 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. \$29.95

05H24 **Radio Handbook, 23rd Ed.** by William I. Orr W8SAI 840 pages of everything you wanted to know about radio communication. \$39.95

02B10 **Heath Nostalgia** by Terry Perdue K8TP 124 page illustrated history of the Heath Company. Includes many fond memories contributed by long-time Heathkit employees. \$9.50

10DF92 **1993 Callbook Supplement** An update to the 1992 International and American callbooks. \$10.00

12E76 **Basic Electronics** Prepared by the Bureau of Naval Personnel Covers the important aspects of applied electronics and electronics communications. \$10.95

12E41 **Second Level Basic Electronics** Prepared by the Bureau of Naval Personnel Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. \$9.95

01D45 **The Illustrated Dictionary of Electronics, 5th Ed** by Rufus P. Turner and Stan Gibilisco An exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables. \$26.95

20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** compiled by M.N. Beilman An invaluable reference for anyone involved in Vintage Radio restoration. \$11.95

20N096 **How To Read Schematics (4th Ed.)** by Donald E. Herrington Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. \$14.95

20N097 **Radio Operator's World Atlas** by Walt Stinson, W0CP This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. \$17.95

20N098 **Electromagnetic Man** by Cyril Smith and Simon Best Health and hazard in the electrical environment. \$29.95

20N020 **Secrets of RF Circuit Design** by Joseph J. Carr Written in clear non-technical language, covers everything from antennas to transistors. \$19.50

20N107 **Ham Stuff** A comprehensive buyer's guide and directory. \$19.95

20N109 **73 Magazine Index 1960-1990** A complete index to every article published in 73 Magazine through 1990. Book \$15.00 IBM software (specify type) \$20.00

20N110 **Product Reviews Since 1945** Contains an index to 3,400 product reviews that have appeared in QST, CQ, HR, 73 and Radcom. Book \$12.95 IBM Software 5.25 \$10.00

WAYNE'S PICKS

SS8756 **Warning! The Electricity Around You May Be Hazardous To Your Health** by Ellen Sugarman An invaluable guide to the risks of electromagnetic fields, and steps you can take to protect yourself and your family. \$11.00

"We The People" **Declare War! On Our Lousy Government.** by Wayne Green A "must read" for every american taxpayer. Solutions to every problem facing our government today. \$12.95

ED86751 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** by John Gatto If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading. \$9.95.

NEW STUFF

AR3762 **Your QRP Operating Companion** No special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. \$8.00

AR3878 **Your VHF Companion** Explore the fascinating activities on the VHF bands: FM and repeater, packet, CW, & SSB, satellites, ATV, transmitter hunting, and more. \$8.00

AR3959 **Your Packet Companion** Perfect for the packet newcomer. \$8.00

Uncle Wayne's Bookshelf Order Form

You may order by mail, telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total

Shipping: All orders add \$5.00 shipping. U.S. orders shipped UPS. (Alaska & Hawaii shipped via mail.) Airmail to Canada and all overseas orders FOB Peterborough, NH. Make checks payable to "Uncle Wayne's Bookshelf."

SHIPPING
TOTAL

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL \$ _____ QAE QMC QVISA QCheck/Money Order

Card # _____ Expiration Date _____

Mail: 73 Magazine, Attn. Uncle Wayne, PO Box 3080, Peterborough, NH 03458

Telephone: (603) 924-4196 (800) 234-8458 FAX: (603) 924-8613

RF0983

UHF/VHF PACKET

01P22-2 **The Packet Radio Handbook (2nd Ed.)** by Jonathan L. Mayo KR3T "...the definitive guide to amateur packet operation."—Gwyn Reedy W1BEL Only \$16.95

09V11 **The Basic Guide to VHF/UHF Ham Radio** by Edward M. Noll Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. \$6.50

20N019 **U.S. Repeater Mapbook** by William Smith N6MQS The Guide for traveling radio amateurs. \$9.95

03R02 **RTTY Today** by Dave Ingram K4TWJ Most comprehensive RTTY guide ever published. \$8.50

ANTENNAS

20N108 **The Easy Wire Antenna Handbook** by Dave Ingram K4TWJ. Gives you all of the needed dimensions for a full range of easy to build and erect "sky wires." \$9.50

01A70 **Practical Antenna Handbook** by Joseph J. Carr Design, build, modify, and install your own antennas. \$22.95

10A342 **All About Verticle Antennas** by William Orr Comprehensive coverage of amateur communications. \$10.95

10A343 **All About Cubical Quad Antennas** by William Orr and Stuart Cowan "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. \$11.95

10A345 **Beam Antenna Handbook** by William Orr and Stuart Cowan Everything you need to know about beam design, construction, and operation. \$11.95

10A346 **Simple, Low-Cost Wire Antennas For Radio Amateurs** by William Orr and Stuart Cowan All New! Low-cost, multi-band antennas; inexpensive beams, "invisible" antennas for hams in "tough" locations! New data. \$11.95

SOFTWARE

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles. \$19.50

04M55 **Advanced Edition** \$29.95

20N021 **No Code Ham Radio Education Package** Computer software package. Includes computer aided instruction software (IBM compatible), 200 page Ham Radio Handbook. \$28.95

20N022 **Ham Operator Education Package** Computer software contains five IBM compatible discs with all questions for all license classes, plus "Morse Academy" code teaching software that takes you from 0-20 wpm. \$28.95

Lanze Code Programs—(Available on 5 1/4" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	IBMO1	COMO1	\$14.95
Tech	IBMO2	COMO2	\$14.95
General	IBMO3	COMO3	\$14.95
Advance	IBMO4	COMO4	\$19.95
Extra (New Pool)	IBMO5	COMO5	\$19.95

IBM06, COM06 **IBM/Commodore Tech No Code—Lanze Code Program** Contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. \$24.95

IBM97 **Amateur Radio Part 97 Rules** New Edition, complete FCC rules. \$9.00

CODE TAPES

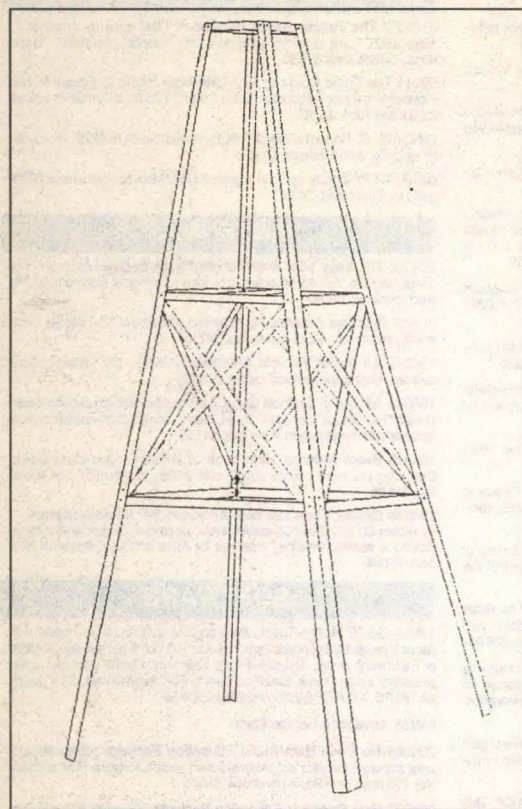
73T05 **"Genesis"** \$5.95
5 wpm—This beginning tape, takes you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way.

73T06 **"The Stickier"** \$5.95
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are set at 13 wpm and spaced at 5 wpm.

73T13 **"Back Breaker"** \$5.95
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steady-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous"** \$5.95
20+ wpm Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per.

new products



GLEN MARTIN ENGINEERING

Glen Martin Engineering has announced the addition of two new roof towers to its aluminum antenna support line. The premier model is the RT-936, a 9-foot four-leg tower capable of mounting up to 28 square feet of wind load. This tower weighs just 78 pounds and the price is \$378.75.

The lighter model is the RT-832, weighing only 37 pounds. This four-leg tower stands 8 feet tall, and will support wind loads of up to eight square feet. This tower is priced at \$189.95.

Both towers are UPS shippable. Both come complete with rotator mounting supports and a top plate stamped for direct thrust bearing bolt-up. The towers are constructed of rugged 6061-T6 angle aluminum with stainless steel hardware.

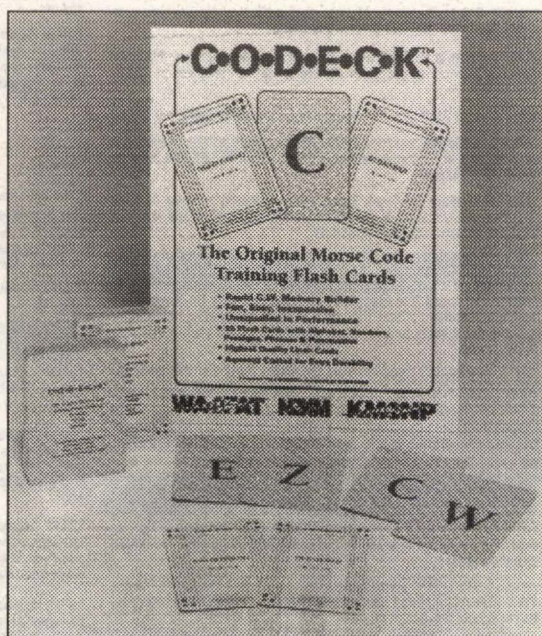
For more information, contact Glen Martin Engineering, Route 3, Box 322, Boonville MO 65233; (816) 882-2734, FAX (816) 882-7200. Or circle Reader Service No. 202.

CODECK

CODECK has introduced a new and obvious concept for learning Morse code: phonetic flash cards. Developed by three veteran amateur radio instructors, these cards can be used by the student alone, or with the help of a spouse or a friend. The ease of use, fun, and phonetics combine to give fast results.

These cards are manufactured by one of the country's leading playing card manufacturers, using only the highest quality linen card stock. Each card is aqueous-coated for extra durability and longevity.

The suggested retail price is \$11.99 for the deck of 56 cards. For further information, contact CODECK, c/o MarCom Center, 22651 Lambert Street, Suite 109, Lake Forest CA 92630; (714) 380-0399. Or circle Reader Service No. 203.



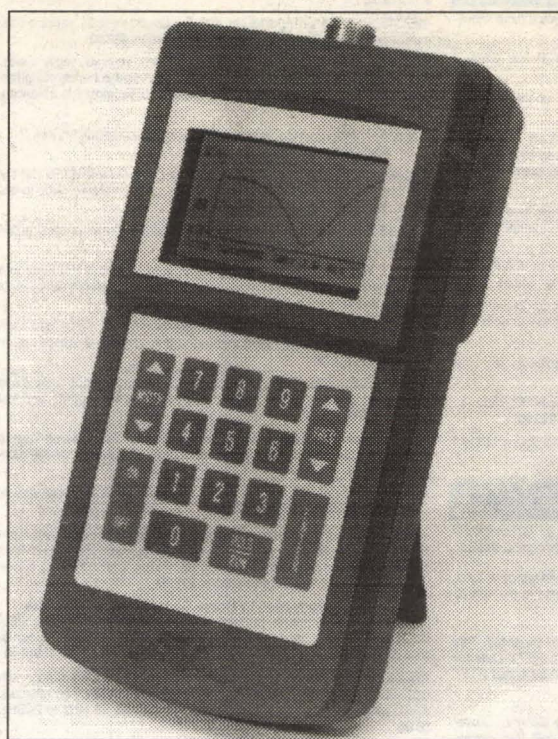
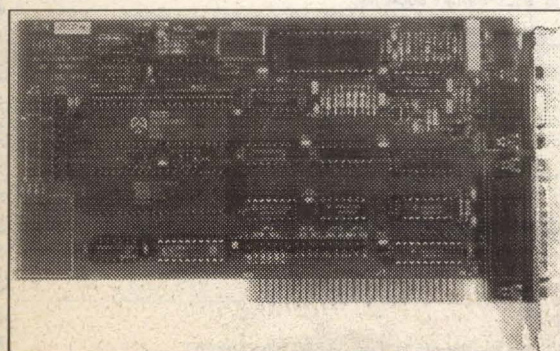
HAMILTON AREA PACKET NETWORK

The Hamilton Area Packet Network (H.A.P.N.) is proud to announce a newly developed digital controller card for the IBM PC and compatible computer. The card is called the "HAPN-2" and can be easily inserted into any available slot in your PC. The HAPN-2 card is the next generation succeeding the HAPN-1, first introduced in 1986.

The Hapn-2 supports two simultaneous channels of packet operation. Also, the device supports other digital modes, including CW, RTTY, AMTOR, WEFAX, and SSTV. Interfacing the card is simple and versatile.

You can buy the HAPN-2 controller card assembled and tested, complete with AX25 host software, set-up and test programs, and documentation for US\$185.00 (CAN\$230.00). A full parts kit with software and documentation is US\$157.00 (CAN\$190.00). A semi-parts kit including software, documentation, bare board, end bracket, and preprogrammed GAL is US\$80.00 (CAN\$95.00). Shipping is \$10.00.

Payments should be made to H.A.P.N. by international check or money order. Or order by credit card. To get further information, contact H.A.P.N., 5193 White Church Road, Mount Hope, Ontario, Canada L0R1W0; (416) 692-3802, FAX (416) 574-5443. Or circle Reader Service No. 208.



ADVANCED ELECTRONIC APPLICATIONS

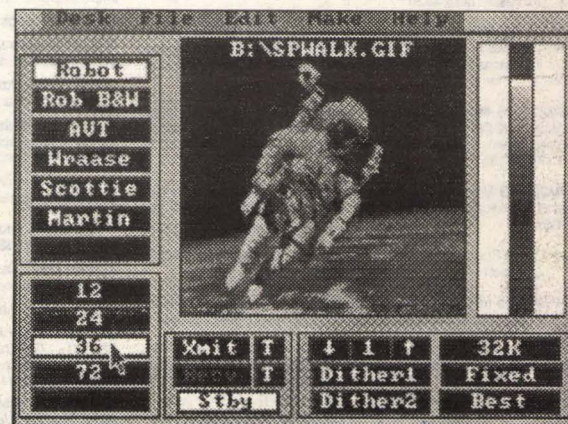
For antenna enthusiasts everywhere, the new AEA SWR-121 hand-held antenna analyzer provides comprehensive antenna performance information in an easy-to-read graphic format. With its LCD spectrum display, the SWR-121 shows an antenna's SWR curve over an entire frequency range, unlike other instruments which can look at only one frequency at a time. This battery-operated unit is designed for portability and easy use.

For more information, contact Advanced Electronic Applications, Inc., P.O. Box C2160, 2006 196th St. SW, Lynnwood WA 98036; Sales: (206) 774-5554; Literature request line: (800) 432-8873. Or circle Reader Service No. 201.

ABSOLUTE VALUE

Pasokon TV Version 1.2 has been released by Absolute Value Systems. This is a popular PC-based system with an interface that fits inside the computer. Features include on-screen tuning indicator, built-in test pattern generator, and automatic fine-tuning.

Pasokon TV can handle all popular SSTV transmission modes and is compatible with IBM 286 or later PCs, ATs, or clones with VGA color, one expansion slot, and 640K memory. The \$229.95 price includes interface, software, and manual. For more information contact Absolute Value Systems, 115 Stedman Street, Chelmsford MA 01824-1823; (508)256-6907. Or circle Reader Service No. 206.



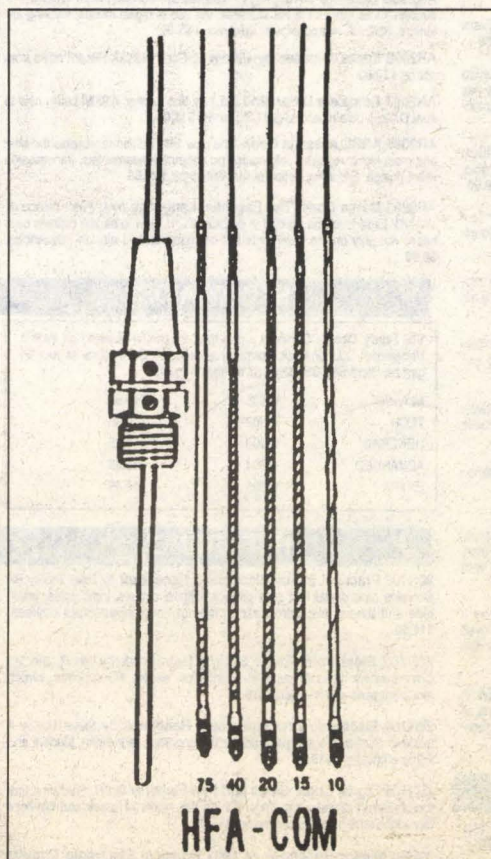
ANTENNA SALES & ACCESSORIES

A.S.A. has introduced a new HF antenna package for the mobile amateur radio enthusiast. Model HFA-COM (High Frequency Antenna Combination) consists of five separate "Fiberwhips" for the 10, 15, 20, 40, and 75 meter bands.

These Fiberwhips have a unique design, with a 2-1/2" bottom ferrell with 3/8 X 24 thread for heavy wind load. No tuning is needed with each breakdown and setup.

The Fiberwhips are made of 3/8" Fiberglass staff with heavy gauge helically wound copper wire, covered with industrial grade black heat shrink and a tapered 7-17 tempered stainless steel whip. Other hardware is solid brass with nickel chrome plating for weather resistance. The assembled length is approximately 8 feet, with a high wattage rating.

The HFA-COM is priced at \$65.00 and will be shipped UPS within the continental USA for \$5.00 S & H. For mounting accessories and other information, contact: A.S.A., P.O. Box 3461, Myrtle Beach, SC 29578; (800) 722-2681. Or circle Reader Service No. 207.

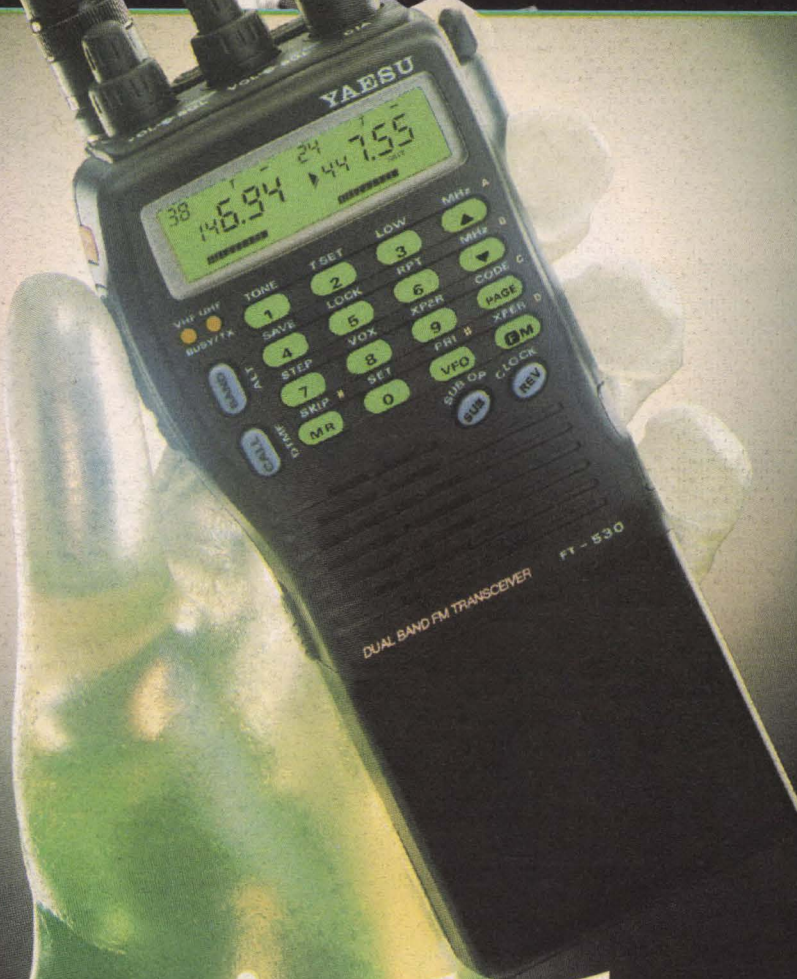


FT-530 Dual Band Handheld

- **Frequency Coverage:**
2-Meters 130-174 MHz RX
140-150 MHz TX
70 cm 430-450 MHz RX/TX
- 82 Memories (41 per band)
- 4 TX Power levels
w/FNB-25: 2.0, 1.5, 1.0, 0.5W
w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- Dual in-band receive feature (V/V, U/U or V/U receive operation)
- DTMF Paging and Coded squelch included.
- AOT – Auto On-Timer with built-in clock
- ABS – Automatic Battery Saver (Super battery life, each band can have separate battery saver)
- Built-in VOX
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Built-in CTCSS with dual decode
- ATS – Automatic Tone Search (displays incoming CTCSS frequency)
- Back-lit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
NC-42 1-hour Desk Charger
FNB-25 600 mAh Battery (2 watt)
FNB-26 1000 mAh Battery (2 watt)
FNB-27 600 mAh Battery (5 watt)
FBA-12 6 AA Cell Holder
CSC-56 Vinyl Case w/ FNB-25
CSC-58 Vinyl Case w/ FNB-26/27
E-DC-5 12 VDC Adaptor
YH-2 Headset for VOX
MH-12A2B Speaker Mic
MH-18A2B Lapel Speaker Mic
MH-19A2B Mini Earpiece Mic
MH-29A2B LCD Display Mic with Remote Functions
MMB-54 Mobile Mounting Hanger

"Look at this new FT-530!
Simultaneous receive on VHF
and UHF, automatic "on" timer,
82 memory channels..."

"Yaesu did it again!"



Bright minds lead to brilliant "firsts."

That's right, brilliant innovative first-time ever features which make the FT-530 our most exciting HT addition.

Exclusive break-through features, too. Like flexible in-band dual receive. Not just V/U receive. With the FT-530 you can listen to two, 2-meter signals at the same time!

Another remarkable first is the Auto On-TimerSM. Here's how it works. Choose the hour you'd like the radio to begin operating. For example, set the time for the morning, then wake up to your favorite net. What's more, the built-in 24-hour clock displays the time when the radio is off.

First out with 82 memory channels included, not an option; a real plus for storing all your favorite frequencies. With this HT, just open the box and QSO.

There's a lot of other terrific features too, such as built-in VOX and DTMF paging. And, since we know you'll find the FT-530 indispensable, we've included an automatic battery saver and voltage display – a powerful handful of exclusive features!

Be the first at your dealer's door to buy one, and the first to show off your new FT-530. What a bright idea!

Multi-Function Digital Display
Speaker Mic and S Meter. (Optional)

NEW



YAESU

Performance without compromise.SM

© 1992 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701 (310) 404-2700

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

Two Antennas

Twice the Fun!

"...bringing you another nonstop 60 minutes of your kind of music from..."

"...fire has jumped to adjacent apartment building; requesting additional units..."

"...appears to be gang-related, large number of youths on foot moving toward..."

"...unidentified object does not respond to radio; attempting to make contact..."

"...blackout apparently caused by car striking utility pole at corner of..."

"...search from the northwest quadrant and proceed south, maintain visual..."

"...do not, repeat, do not approach intake by boat since dock is damaged in..."

"...campers are advised to leave upper elevations before sundown due to..."

"...conditions for trout in the deeper pools best before 6 am, they're taking..."

"...bright yellow, red trim Piper last reported lost and disoriented in fog near..."

"...sending a chopper over to have a look before the news people find out about..."

A 2-Meter Transceiver Plus A WideBand Receiver

Two antennas on the outside tell you there's twice the fun on the inside! ICOM designed two fine radios into one compact, durable unit—the IC-2SRA!

You can talk on 2 meters (a 440 model is also available) while monitoring another frequency on the same band, or listen in to the fascinating wideband world of 25-905 MHz.

The 25-905 MHz (guaranteed specifications!) receiver lets you keep track of all the exciting activity on VHF/UHF— emergency, aircraft, satellite, military and marine frequencies— plus commercial FM & TV audio!

"WOW!... in a class by itself... loaded with features... satisfies needs that none of the other rigs can... if you compare... the 2SRA is definitely a better deal..."

—QST Oct. 1992

Separate Controls

Truly two radios in one, with separate volume, squelch & tuning controls for each band. The large, easy-to-read function display shows both operating frequencies in use, S-indicators, and the memory settings for both bands.

High Performance Features

We paid special attention to the battery pack: it has a long duty cycle, so your fun won't fade when you least expect it.

Scanning, memories, clock/timers, pager, code squelch, power saver— they're all in there, along with the highest performance feature of them all: it's an ICOM!

IC-2SRA

For more information,
call our Brochure Hotline
1-206-450-6088

ICOM®

ICOM America, Inc., 2380-116th Avenue N.E., Bellevue, WA 98004
All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. The ICOM logo is a registered trademark of ICOM America. 23RA493